

77 02272

BUCA-0010

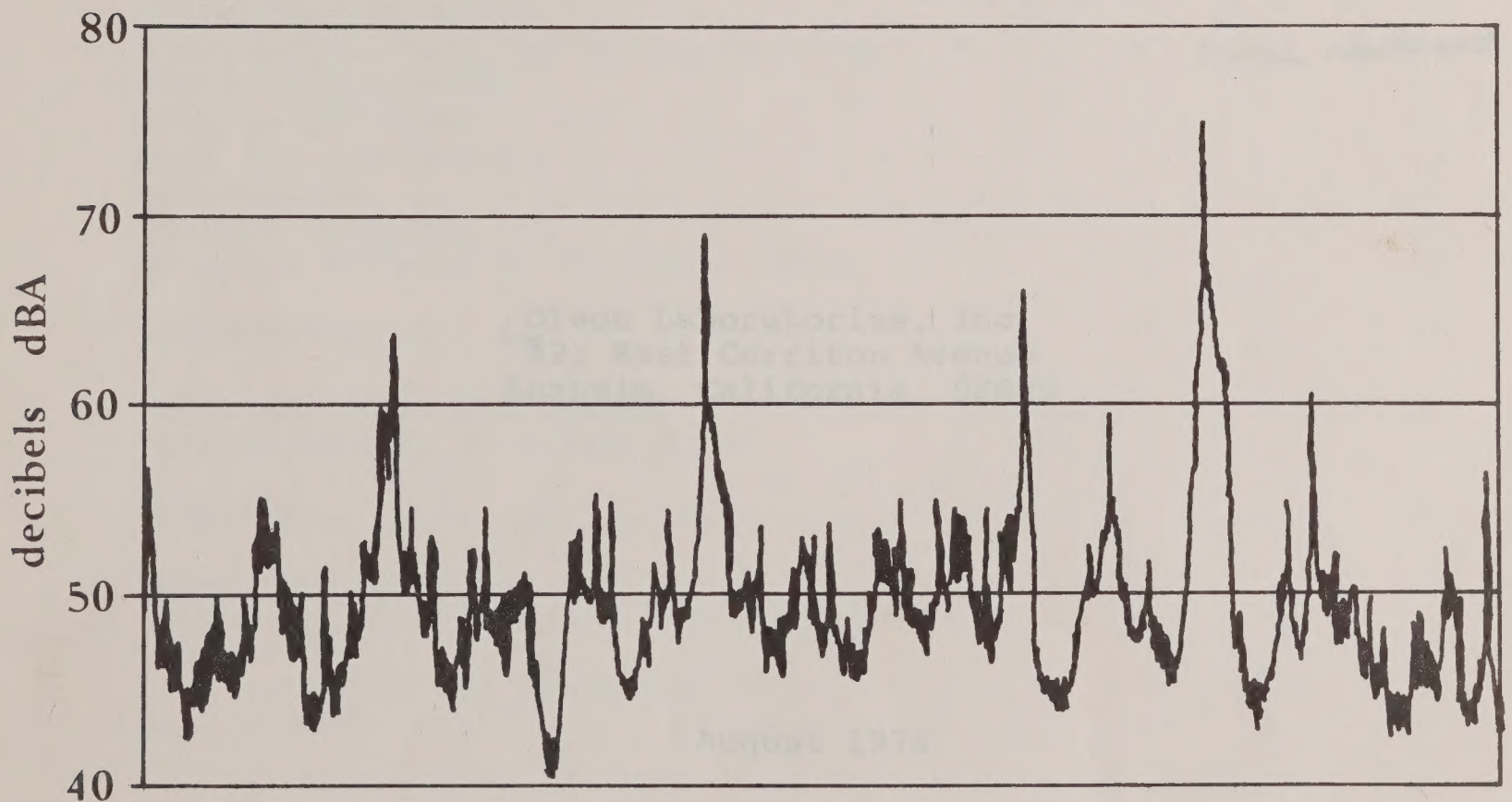
INSTITUTE OF GOVERNMENTAL STUDIES LIBRARY
109 PHILOSOPHY HALL
UNIVERSITY OF CALIFORNIA
BERKELEY, CA 94720

Noise Element

INSTITUTE OF GOVERNMENTAL
STUDIES LIBRARY

MAR 9 1977

UNIVERSITY OF CALIFORNIA



Burbank, California

77 02272

INSTITUTE OF GOVERNMENTAL STUDIES LIBRARY
109 PHILOSOPHY HALL
UNIVERSITY OF CALIFORNIA
BERKELEY, CA 94720

INSTITUTE OF GOVERNMENTAL
STUDIES LIBRARY

MAR 9 1977

UNIVERSITY OF CALIFORNIA

TABLE OF CONTENTS

INTRODUCTION	1
COMMUNITY SURVEY	1
STANDARDS AND CRITERIA	2
Human Physical Health Studies The Relationship of Current Noise Levels to Human Health	2
NOISE CRITERIA	3
NOISE SOURCES, POLICIES AND PROGRAMS	7
Goals	7
General Policies	8
Governmental Coordination	8
Aircraft Noise	10
Helicopter Noise	10
Street and Freeway Noise	10
Motor Vehicle Noise	10
Alternative Modes of Transportation	10
Construction Noise	12
Industrial Noise	12
Land Use and Noise	12
Legislation	13
General Programs	14
Programs Related to Transportation	15
IMPLEMENTATION	16
Potential Land Use Changes	16
Responsibility of Enforcement	16
ANALYSIS	17
Interrelationships	17
Community Annoyance and Activity Interference	17
Criteria	17
Citizen Input and Awareness	17
Conclusions	17

BURBANK

NOISE ELEMENT

City planning Burbank
" " Noise abatement

Olson Laboratories, Inc.
421 East Cerritos Avenue
Anaheim, California 92805

August 1974

BOISE ELEMENT
BUREAU

Alison Laboratories, Inc.
421 East Capitol Avenue
Anchorage, Alaska 99502

August 1974

TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION	1
COMMUNITY SURVEY	1
STANDARDS AND CRITERIA	3
Human Physical Health Standards	3
The Relationship of Current Criteria to Burbank	4
NOISE CRITERIA	5
NOISE GOALS, POLICIES AND PROGRAMS	7
Goals	7
General Policies	8
Governmental Coordination	9
Aircraft Noise	10
Helicopter Noise	10
Street and Freeway Noise	11
Motor Vehicle Noise	11
Alternative Modes of Transportation	12
Construction Noise	12
Industrial Noise	12
Land Use and Noise	13
Legislation	13
General Programs	14
Programs Related to Transportation	15
IMPLEMENTATION	16
Potential Land Use Changes	16
Responsibility of Enforcement	18
ANALYSIS	19
Interrelationships	19
Community Annoyance and Activity Interference	
Criteria	21
Citizen Input and Awareness	23
Conclusions	23

TABLE OF CONTENTS

Page	
1	INTRODUCTION
1	COMMUNITY SURVEY
3	STANDARDS AND CRITERIA
3	Human Physical Health Standards
4	The Relationship of Current Criteria to Research
5	NOISE CRITERIA
7	NOISE GOALS, POLICIES AND PROGRAMS
7	Goals
8	General Policies
9	Governmental Coordination
10	Aircraft Noise
10	Helicopter Noise
11	Street and Freeway Noise
11	Motor Vehicle Noise
12	Alternative Modes of Transportation
12	Construction Noise
12	Industrial Noise
12	Land Use and Noise
12	Regulation
12	General Programs
12	Programs Related to Transportation
16	IMPLEMENTATION
16	Potential Land Use Changes
18	Responsibility of Enforcement
19	ANALYSIS
19	Interrelationships
21	Community Annoyance and Activity Interference
21	Criteria
22	Citizen Input and Awareness
23	Conclusions

TABLE OF CONTENTS (continued)

	<u>Page</u>
ANNOTATED BIBLIOGRAPHY	AB-1
APPENDIXES	
A. Technical Discussion of Noise	A-1
B. Federal and State Noise Standards	B-1
C. Noise Standards by Category of Use	C-1
D. General Properties of Sleep	D-1
E. Glossary	E-1
F. Field Survey Data	F-1
MAPS	
1. Existing Noise Contours	
2. Project Noise Contours	

TABLE OF CONTENTS (continued)

Index

APPENDICES A2-1

APPENDICES

A. Technical Discussion of Noise	A-1
B. Federal and State Noise Standards	B-1
C. Noise Standards by Category of Use	C-1
D. General Properties of Sleep	D-1
E. Glossary	E-1
F. Field Survey Data	F-1

MAPS

1. Existing Noise Contours
2. Project Noise Contours

INTRODUCTION

The Noise Element for the City of Burbank was undertaken in compliance with Government Code Section 65302(g) which requires a Noise Element in all city and county General Plans.

The Noise Element for any city will become an integrated part of the General Plan. Therefore, it is important that the Noise Element be consistent with the general goals, policies, and programs of the city. In particular, the primary goal of the City of Burbank is to provide its residents and visitors with a safe and pleasing environment. Specifically, Burbank's noise-related goal throughout the City is to regulate the noise environment so that the desired noise levels by land use will be achieved in the shortest period of time to protect the health, safety and welfare of its existing and future residents.

COMMUNITY SURVEY

Community noise is a complex problem. Noise can be annoying, can interfere with sleep, work or recreation and, in some instances, cause physical and psychological damage.

Generally, the community noise problem centers around describing community noise which is primarily transportation-related. The source, time, and locational variations of noise must be presented clearly so that the descriptions are relevant to the effects upon people.

To distinguish noise levels within Burbank, two different types of data were processed and analyzed. First, existing and proposed transportation noise sources were identified. The results of this identification process are two noise contour maps. Each map contains a series of lines indicating the approximate zone where

INTRODUCTION

The Noise Element for the City of Burbank was undertaken in compliance with Government Code Section 65302 (g) which requires a Noise Element in all city and county General Plans.

The Noise Element for any city will become an integrated part of the General Plan. Therefore, it is important that the Noise Element be consistent with the general goals, policies, and programs of the city. In particular, the primary goal of the City of Burbank is to provide its residents and visitors with a safe and pleasing environment. Specifically, Burbank's noise-related goal throughout the City is to regulate the noise environment so that the desired noise levels by land use will be achieved in the shortest period of time to protect the health, safety and welfare of its existing and future residents.

COMMUNITY SURVEY

Community noise is a complex problem. Noise can be annoying, can interfere with sleep, work or recreation and, in some instances, cause physical and psychological damage. Generally, the community noise problem consists of sound-declining community noise which is primarily transportation-related. The source, time, and locational variations of noise must be presented clearly so that the descriptions are relevant to the effects upon people.

To distinguish noise levels within Burbank, two different types of data were processed and analyzed. First, existing and proposed transportation noise sources were identified. The results of this identification process are two noise contour maps. Each map contains a series of lines indicating the approximate noise where

a certain level of sound may be found. These zonal lines will fluctuate either way depending on weather conditions, time of day, and volume of traffic. The Existing Noise Contour Map indicates the existing noise zones throughout Burbank. The 1985 Projected Noise Contour Map indicates those areas where the noise zones will have some change due to changes in surface traffic volumes or new technology in aircraft design. Both maps are presented at the end of the text.

Secondly, a community noise survey was conducted by Olson Laboratories engineers. Generally, Burbank can be classified as having residual noise levels above the average suburban city due to the following factors:

- The existing noise environment in Burbank is primarily determined by transportation sources.
- The major local surface transportation routes have residual noise levels ranging from 50 dBA to 63 dBA¹.
- Areas adjacent to the Venture and Golden State freeways exhibit residual noise levels ranging from 62 dBA to 69 dBA depending on the grade and separation of the freeway and residential areas.
- The residual noise levels in the residential areas west of the Golden State freeway and north of the Venture freeway range from a low of 45 dBA to a high of 63 dBA with most areas falling into a 46 dBA to 48 dBA range.

¹The dBA values mean the 24-hour, continuous level which is equivalent on an energy basis to the intermittent and time-varying noise levels actually experienced. This equivalent noise level is sometimes called the Noise Exposure Index (NEI) or, more recently, the $L_{eq(24)}$ value.

a certain level of sound may be found. These sound lines will fluctuate either way depending on weather conditions, time of day, and volume of traffic. The existing Noise Contour Map indicates the existing noise zones throughout Burbank. The 1985 projected Noise Contour Map indicates those areas where the noise zones will have some change due to changes in surface traffic volumes or new technology in aircraft design. Both maps are presented at the end of the text.

Secondly, a community noise survey was conducted by Otis Laboratories engineers. Generally, Burbank can be classified as having residual noise levels above the average suburban city due to the following factors:

- * The existing noise environment in Burbank is primarily determined by transportation sources.
- * The major local surface transportation routes have residual noise levels ranging from 50 dBA to 63 dBA.
- * Areas adjacent to the Ventura and Golden State freeways exhibit residual noise levels ranging from 63 dBA to 69 dBA depending on the grade and separation of the freeway and residential areas.
- * The residual noise levels in the residential areas west of the Golden State freeway and north of the Ventura freeway range from a low of 45 dBA to a high of 63 dBA with most areas falling into a 45 dBA to 58 dBA range.

The dBA values mean the 24-hour, continuous level which is equivalent on an energy basis to the intermittent and varying noise levels actually experienced. This equivalent noise level is sometimes called the Noise Exposure Index (NEI) or, more recently, the $L_{eq}(24)$ value.

Areas located east of the Golden State freeway and Glenoaks Boulevard exhibit the lowest residual levels within the City. These areas range from 42 dBA in the hillside area to 45 dBA near Sunset Canyon Drive.

The Hollywood-Burbank Airport is one of the contributors to the current noise levels. The 70 CNEL contour line covers both industrial and residential land uses. It should be noted that the residual noise levels within the 70 CNEL area ranges from 47 to 48 dBA when general and commercial airplanes are not present. The interference level is higher in this area than other, noiser areas due to the low frequency of aircraft flights as compared to the steady noise levels adjacent to the freeways. Therefore, the 70 CNEL contour area indicates a more precise description than the residual measurements of the noise environment juxtaposed to the airport.

A computer analysis was made regarding existing and potential railroad noise. The contour map at the end of the Element indicates that the major area impacted by railroad noise is the industrial land use adjacent to Empire Avenue. The two remaining railroad right-of-ways are within the influence of the Golden State freeway noise environment, which effectively overpowers the railroad-generated noise.

The greatest source of noise complaints in residential areas are related to air conditioners during the summer months, with barking dogs and noise emanating from commercial and industrial land uses adjacent to residential land uses producing the second greatest source of complaints.

STANDARDS AND CRITERIA

Human Physical Health Standards

Several issues must be considered in the development of noise standards for Burbank. Every community desires a quiet

Areas located east of the Golden State Freeway and Glendale
Boulevard exhibit the lowest residual levels within the City.
These areas range from 43 dBA in the hillside area to 45 dBA
near Sunset Canyon Drive.

The Hollywood-Burbank Airport is one of the contributors to the
current noise levels. The 70 CNEL contour line covers both industrial
and residential land uses. It should be noted that the residual noise
levels within the 70 CNEL area ranges from 47 to 48 dBA when general and
commercial airplanes are not present. The interference level is higher
in this area than other, noisier areas due to the low frequency of aircraft
flights as compared to the steady noise levels adjacent to the freeways.
Therefore, the 70 CNEL contour area indicates a more precise description
than the residual measurements of the noise environment juxtaposed to the
airport.

A computer analysis was made regarding existing and potential
railroad noise. The contour map at the end of the Element indicates
that the major area impacted by railroad noise is the industrial land use
adjacent to Empire Avenue. The two remaining railroad right-of-ways are
within the influence of the Golden State Freeway noise environment, which
effectively overpowers the railroad-generated noise.

The greatest source of noise complaints in residential areas are
related to air conditioners during the summer months, with barking dogs
and noise emanating from commercial and industrial land uses adjacent to
residential land uses producing the second greatest source of complaints.

STANDARDS AND CRITERIA

Human Physical Health Standards

Several issues must be considered in the development of
noise standards for Burbank. Every community desires a quiet

local environment. Achieving noise levels considered acceptable as a community standard is easier for some communities than it is for others. Because Burbank contains two major freeways, an airport and a large industrial base, the majority of the community noise levels are high. Furthermore, noise emissions are produced by sources outside of the City's jurisdictional limits. It is desirable that the noise control standards in community planning and building should be consistent with those in noise enforcement. While standards may reflect community goals, they should be sufficient for the community and realistically enforceable in the contemporary environment.

In the case of Burbank, to set a maximum allowable noise level on a specific land use which is not attainable because of the existing noise level (i.e., setting a maximum dBA of 50 when the existing residual level is 68 dBA) would create a situation in which the City could not effectively or legally enforce the intent of the law. Therefore, desired noise levels will be designed in relationship to the existing situation. As new motor vehicle and aircraft noise control technology is introduced, these goals will be reviewed and renewed in relationship to the existing and desired environmental standards.

Since Burbank has both an airport and a well-developed industrial base, the City will consider giving greater accommodation to noise than would a totally residential community. Reflecting on the discussion on the effects of noise, there are basically two distinct community considerations. One is health and the other is annoyance.

The Relationship of Current Criteria to Burbank

The community noise survey indicated that the average, continuous 24-hour noise level is 52 dBA. However, in areas near the Golden State and Ventura Freeways, the 24-hour average levels in the residential areas exceed 59 dBA and, 42 percent

local environment. Achieving noise levels considered acceptable as a community standard is easier for some communities than it is for others. Because Burbank contains two major freeways, an airport and a large industrial base, the majority of the community noise levels are high. Furthermore, noise emissions are produced by sources outside of the City's jurisdictional limits. It is desirable that the noise control standards in community planning and building should be consistent with those in noise abatement. While standards may reflect community goals, they should be sufficient for the community and realistically enforceable in the contemporary environment.

In the case of Burbank, to set a maximum allowable noise level on a specific land use which is not attainable because of the existing noise level (i.e., setting a maximum dBA of 55 when the existing residential level is 65 dBA) would create a situation in which the City could not effectively or legally enforce the intent of the law. Therefore, desired noise levels will be determined in relationship to the existing situation. As new motor vehicles and aircraft noise control technology is introduced, these goals will be reviewed and renewed in relationship to the existing and desired environmental standards.

Since Burbank has both an airport and a well-developed industrial base, the City will consider giving greater attention to noise that would affect residential community. Reflected on the discussion on the effects of noise, there are basically two distinct community considerations. One is health and the other is annoyance.

The Relationship of Current Criteria to Burbank

The community noise survey indicated that the average, continuous 24-hour noise level is 55 dBA. However, in areas near the Golden State and Van Nuys freeways, the 24-hour average levels in the residential areas exceed 55 dBA and, 43 percent

of the time, 65 dBA. Daytime levels are nearly 60 dBA. (This data does not include airport noise.)

As a consequence, a portion of the population of Burbank is exposed to transportation noise levels within the annoyance and activity-interference ranges. A large percentage of the residential area near the freeways lies in the normally unacceptable range of HUD criteria. In some areas adjacent to the freeways, noise exceeds the level identified by EPA as the lowest level which will provide protection against hearing loss to 96 percent of the population who are chronically exposed to noise. If the freeways were being built today, major barrier construction or increased right-of-way protection would be required to protect the adjacent residential land use. From this information, it can be concluded that Burbank is in need of remedial noise control measures related to the adjacent freeways.

The residential areas located within the 70 CNEL contour of the airport are clearly within the annoyance region, but cannot be classified as health hazard areas since jet take off and landings are not a continuous occurrence (i.e., residents are not exposed to 70 dBA for more than 8 hours a day).

Although a community survey was not taken, the relationships shown in Figure 1 would suggest that the areas adjacent to the freeways would be the areas of the greatest amount of noise complaints. The graph indicates the relationship between the noise level produced by a source and the type and number of complaints that theoretically would occur. However, the residents adjacent to the freeways have not publicly complained about their situation as much as those people living in the quieter areas of Burbank.

NOISE CRITERIA

In view of the various problems facing the City, it appears that six distinct approaches should be incorporated into the City's program for environmental noise control. They are:

does not include airport noise.)

As a consequence, a portion of the population of Burbank is exposed

to transportation noise levels within the annoyance and activity-

interference ranges. A large percentage of the residential area near the

freeways lies in the normally unacceptable range of HUD criteria. In some

areas adjacent to the freeways, noise exceeds the level identified by HUD

as the lowest level which will provide protection against hearing loss to

95 percent of the population who are chronically exposed to noise. If the

freeways were being built today, major barrier construction or increased

right-of-way protection would be required to protect the adjacent residential

land use. From this information, it can be concluded that Burbank is in

need of remedial noise control measures related to the adjacent freeways.

The residential areas located within the 70 CNEL contour of the

airport are clearly within the annoyance region, but cannot be classified

as health hazard areas since jet take off and landings are not a continuous

occurrence (i.e., residents are not exposed to 70 dBA for more than 8 hours

a day).

Although a community survey was not taken, the relationships shown

in Figure 1 would suggest that the areas adjacent to the freeways would

be the areas of the greatest amount of noise complaints. The graph indicates

the relationship between the noise level produced by a source and the type

and number of complaints that theoretically would occur. However, the

residents adjacent to the freeways have not publicly complained about

their situation as much as those people living in the quieter areas of

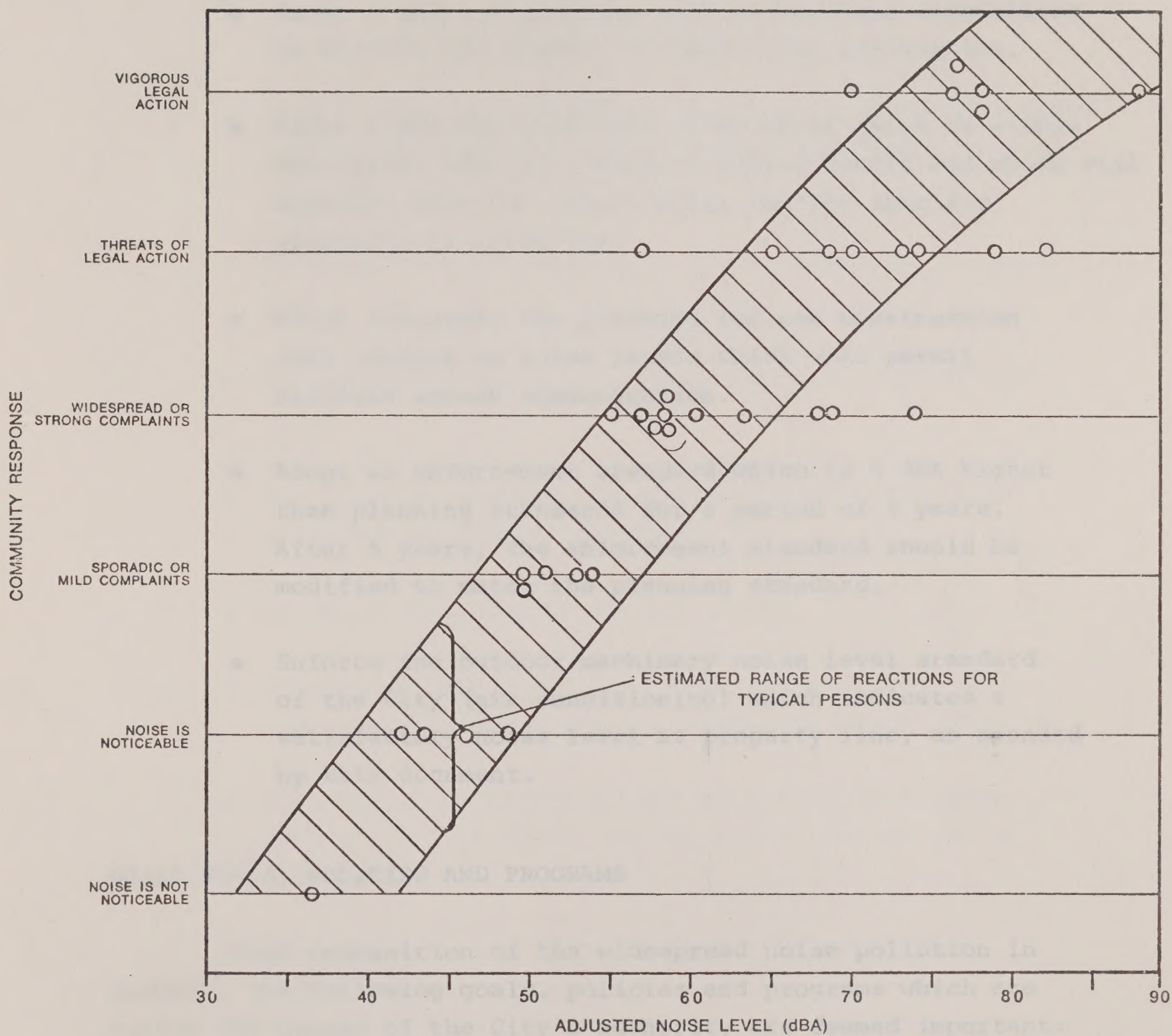
Burbank.

NOISE CRITERIA

In view of the various problems facing the City, it appears

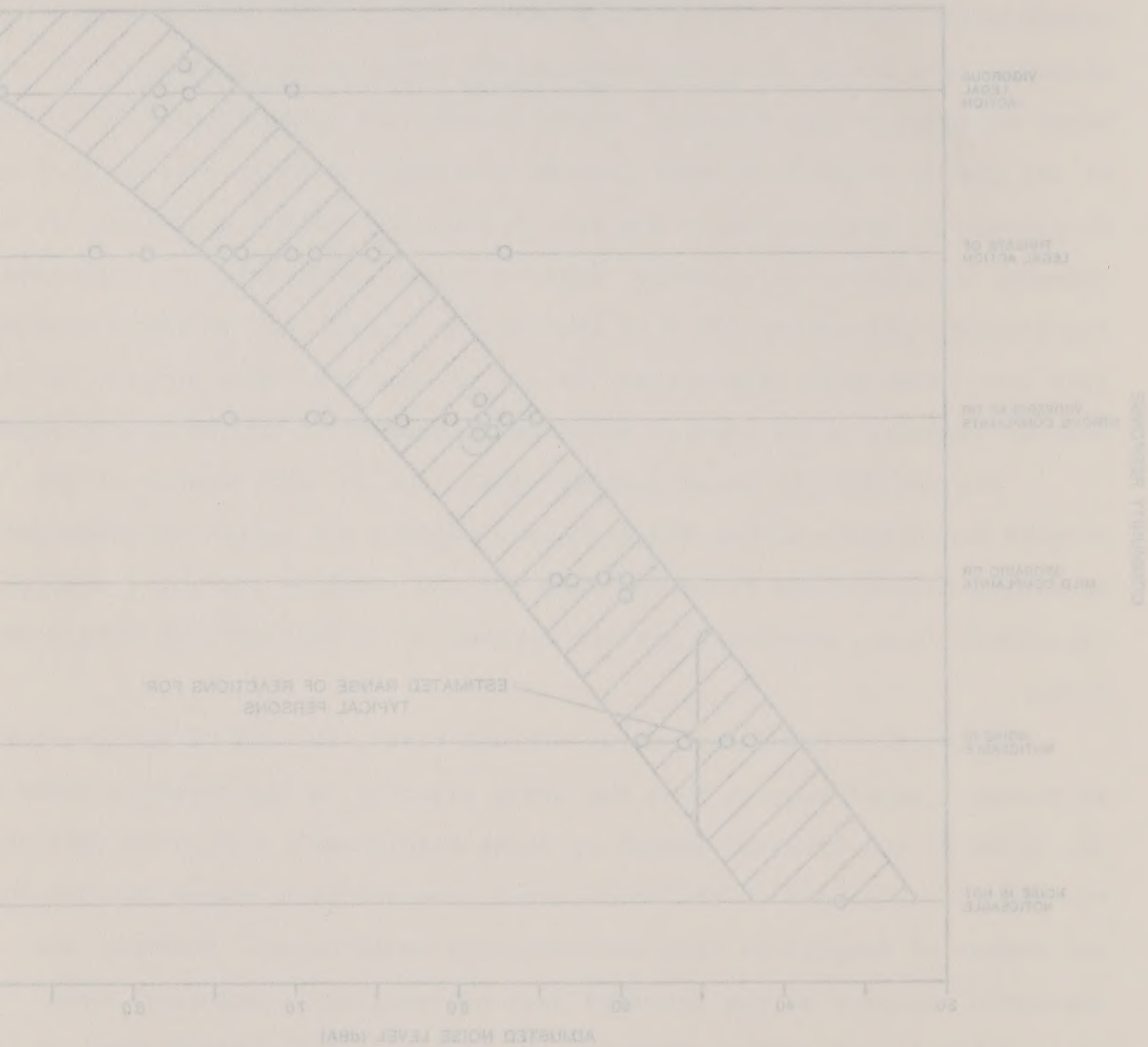
that six distinct approaches should be incorporated into the

City's program for environmental noise control. They are:



RESPONSES SHOWN ARE FOR CONTINUOUS DAYTIME, NONIMPULSIVE, BROAD BAND NOISES IN QUIET SUBURBAN NEIGHBORHOODS, WITH WINDOWS OPEN, WHERE RESIDENTS HAVE HAD NO PREVIOUS EXPOSURE TO NUISANCE NOISES.

Figure 1 EMPIRICAL RELATIONSHIP BETWEEN NOISE LEVEL AND COMMUNITY RESPONSE



REMARKS: THESE ARE FOR CONTINUOUS DAYTIME NONIMPULSIVE NOISE BAND
 NOISE IN QUIET SURROUNDINGS WITH WINDOWS OPEN, WHILE
 PERSONS HAVE HAD NO PREVIOUS EXPOSURE TO NOISE

Figure 1 EMPIRICAL RELATIONSHIP BETWEEN NOISE LEVEL AND COMMUNITY RESPONSE

- Redesignate land use in noise impacted areas to more compatible land use.
- Adopt a joint resolution with surrounding communities to enforce and support airport noise legislation.
- Adopt a maximum permitted noise level which is within the limits that will protect public health and which will consider land use relationship and the specific geographical situation.
- Adopt standards for planning and new construction that conform to noise levels which will permit reliable speech communication.
- Adopt an enforcement standard which is 5 dBA higher than planning standards for a period of 5 years. After 5 years, the enforcement standard should be modified to match the planning standard.
- Enforce the outdoor machinery noise level standard of the City (air conditioning) which indicates a satisfactory noise level at property line, as amended by this document.

NOISE GOALS, POLICIES AND PROGRAMS

With recognition of the widespread noise pollution in Burbank, the following goals, policies and programs which are within the powers of the City's authority are deemed important:

Goals

- To coordinate intergovernmental efforts to abate noise.

• Redesignate land use in noise abatement areas to more compatible land use.

• Adopt a joint resolution with surrounding communities to enforce and support strict noise legislation.

• Adopt a maximum permitted noise level which is within the limits that will protect public health and which will consider land use relationship and the specific geographical situation.

• Adopt standards for planning and new construction that conform to noise levels which will permit visible speech communication.

• Adopt an enforcement standard which is 5 dB higher than planning standards for a period of 2 years. After 2 years, the enforcement standard should be modified to match the planning standard.

• Enforce the outdoor machinery noise level standard of the City (air conditioning) which indicates a satisfactory noise level at property line, as mandated by this document.

NOISE GOALS, POLICIES AND PROGRAMS

With recognition of the widespread noise pollution in urban areas, the following goals, policies and programs which are within the powers of the City's authority are deemed important:

Goals

• To coordinate intergovernmental efforts to abate noise.

- To encourage reduction of the impact of noise from all types of aircraft.
- To encourage the reduction of noise levels produced by all types of motor vehicles.
- To encourage the reduction of noise by lowering highway volumes through the use of alternative modes of transportation.
- To encourage the reduction of the impact of railroad noise.
- To reduce the impact of construction and industrial noise.
- To minimize external noises and prevent them from penetrating quieter pursuits.
- To abate unnecessary outdoor noise.
- To provide the basis for noise evaluation in land use considerations and Environmental Impact Reports.
- To promote increased public awareness concerning the effects of noise, and ways they can assist in reducing noise.
- To protect areas that are presently quiet from future noise impact.

General Policies

- To establish acceptable noise standards consistent with health and quality-of-life goals and employ

- To encourage reduction of the impact of noise from all types of aircraft.
- To encourage the reduction of noise levels produced by all types of motor vehicles.
- To encourage the reduction of noise by lowering highway volumes through the use of alternative modes of transportation.
- To encourage the reduction of the impact of railroad noise.
- To reduce the impact of construction and industrial noise.
- To minimize external noise and prevent them from penetrating quietest quarters.
- To abate unnecessary outdoor noise.
- To provide the basis for noise evaluation in land use considerations and Environmental Impact Reports.
- To promote increased public awareness concerning the effects of noise, and ways they can assist in reducing noise.
- To protect areas that are presently quiet from future noise impact.

General Policies

- To establish acceptable noise standards consistent with health and quality-of-life goals and employ

effective techniques of noise abatement through such means as building codes, subdivision, and zoning ordinances.

- To develop noise reduction strategies and priorities to reduce noise where noise-impacted areas exist.
- To encourage the use of quieter automobiles, machinery, and equipment.
- To encourage the development of a national uniform sound-certification program of published sound ratings for various types of equipment that are sources of noise.
- To repeat periodically a systematic noise survey of the City.
- To develop criteria for location of certain "noise sensitive" land uses and facilities (schools, hospitals). These facilities will be adequately designed and insulated to protect occupants from unusually loud exterior noise.
- To include consideration of the noise environment as a part of land use planning.
- To regulate or abate unnecessary outdoor noises.

Governmental Coordination

- Establish a mechanism to assure coordination of all governmental jurisdictions in the field of noise control.

effective techniques of noise abatement through such means as building codes, subdivision, and zoning ordinances.

* To develop noise reduction strategies and priorities to reduce noise where noise-impacted areas exist.

* To encourage the use of quieter automobiles, machinery, and equipment.

* To encourage the development of a national uniform sound-certification program of published sound ratings for various types of equipment that are sources of noise.

* To repeat periodically a systematic noise survey of the City.

* To develop criteria for location of certain "noise sensitive" land uses and facilities (schools, hospitals, etc.). These facilities will be adequately designed and insulated to protect occupants from unusually loud exterior noise.

* To include consideration of the noise environment as a part of land use planning.

* To regulate or abate unnecessary outdoor noise.

Governmental Coordination

* Establish a mechanism to assure coordination of all governmental jurisdictions in the field of noise control.

- Adopt equipment noise standards and labeling established by the federal government.
- Encourage the federal government to standardize and simplify the measurement methods used in assessing noise impact.

Aircraft Noise

- Encourage the Federal Aviation Administration to assign cruise altitudes high enough to minimize the impact of aircraft on land use.
- Conduct ground operations in a manner to minimize the impact of aircraft noise on adjoining areas.
- Make land uses compatible with airport operations within airport noise-impact boundaries, as defined in California Department of Aeronautics standards. Future development within these impact boundaries should be restricted to compatible uses.
- Encourage the use of noise-suppression devices and other noise-reducing modifications to planes using airports located in the City.
- Develop effective noise barriers in all airport run-up areas when an external noise problem exists.
- Conduct flight operations in a manner to minimize noise.

Helicopter Noise

- Locate and design helistops and heliports to minimize the impact of noise.

- Adopt equipment noise standards and labeling established by the Federal Government.
- Encourage the Federal Government to standardize and simplify the measurement methods used in assessing noise impact.

Aircraft Noise

- Encourage the Federal Aviation Administration to assign cruise altitudes high enough to minimize the impact of aircraft on land use.
- Conduct ground operations in a manner to minimize the impact of aircraft noise on adjoining areas.
- Make land uses compatible with airport operations within airport noise-impact boundaries, as defined in California Department of Aeronautics standards. Future development within these impact boundaries should be restricted to compatible uses.
- Encourage the use of noise-suppression devices and other noise-reducing modifications to planes using airports located in the City.
- Develop effective noise barriers in all airport run-up areas when an external noise problem exists.
- Conduct flight operations in a manner to minimize noise.

Helicopter Noise

- Locate and design heliports and heliports to minimize the impact of noise.

- Conduct helicopter operations in a manner to minimize noise.
- Establish noise criteria for future helistops. Conditional-use approval of helistops should include noise-mitigating conditions.
- Encourage the use of quieter helicopters.

Street and Freeway Noise

- In designing new freeways within the City, give preference to depressed freeways as a method of reducing noise impact on adjacent lands.
- Employ noise mitigation measures in the design of all future streets and highways and insulate highways from adjoining areas wherever possible.
- Where appropriate, require dense landscaping and/or ornamental walls along highway and railroad rights-of-way, to beautify the landscape and reduce noise.

Motor Vehicle Noise

- Encourage legislation for the reduction of the noise impact of automobiles, motorcycles, buses and trucks by lowering the level of sound produced.
- Encourage the development of adequate noise suppression devices (mufflers, etc.) for all motor vehicles operated within the City.
- Encourage strict enforcement of the noise standards in the Motor Vehicle Code and other State and federal legislation pertaining to noise offenders.

- Conduct helicopter operations in a manner to minimize noise.
- Establish noise criteria for future heliports.
- Conditional-use approval of heliports should include noise-mitigating conditions.
- Encourage the use of quieter helicopters.

Street and Freeway Noise

- In designing new freeways within the City, give preference to depressed freeways as a method of reducing noise impact on adjacent lands.
- Employ noise mitigation measures in the design of all future streets and highways and insulate high-ways from adjoining areas wherever possible.
- Where appropriate, require noise landscaping and/or ornamental walls along highway and railroad right-of-way, to beautify the landscape and reduce noise.

Motor Vehicle Noise

- Encourage legislation for the reduction of the noise impact of automobiles, motorcycles, buses and trucks by lowering the level of sound produced.
- Encourage the development of adequate noise suppression devices (mufflers, etc.) for all motor vehicles operated within the City.
- Encourage strict enforcement of the noise standards in the Motor Vehicle Code and other State and Federal legislation pertaining to noise offenders.

Alternative Modes of Transportation

- Encourage development of a mass rapid-transit system with reduced noise emission characteristics.
- Promote more efficient, comfortable and quieter bus service.
- Encourage reduction of traffic volumes to reduce noise on local streets through the development of alternative transportation modes.

Construction Noise

- Purchase quieter machines and vehicles for the City and require quieter equipment in work performed on City contracts.
- Develop and enforce standards to regulate noise from construction activities.
- Require installation of silencers or mufflers on construction equipment intake and exhaust openings.
- Continue to enforce the limitations on hours for construction activity in the City's Noise Ordinance.

Industrial Noise

- Adopt industrial noise performance standards.
- Regulate noise from industrial activities through various forms of licenses, permits, zoning, and registration to meet performance standards that limit maximum permitted noise levels.

Alternative Modes of Transportation

- Encourage development of a mass rapid-transit system with reduced noise emission characteristics.
- Promote more efficient, comfortable and quieter bus services.
- Encourage reduction of traffic volumes to reduce noise on local streets through the development of alternative transportation modes.

Construction Noise

- Purchase quieter machines and vehicles for the City and require quieter equipment in work performed on City contracts.
- Develop and enforce standards to regulate noise from construction activities.
- Require installation of silencers or mufflers on construction equipment intake and exhaust openings.
- Continue to enforce the limitations on hours for construction activity in the City's Noise Ordinance.

Industrial Noise

- Adopt industrial noise performance standards.
- Regulate noise from industrial activities through various forms of licenses, permits, zoning, and registration to meet performance standards that limit maximum permitted noise levels.

Land Use and Noise

- Require acoustical privacy in new and rehabilitated multi-family dwellings consistent with the State of California Uniform Building Code, 1973, Chapter 34.
- Require that noise from motors, appliances, air conditioners, and other consumer products will not disturb the occupants of surrounding properties.
- Require businesses such as hotels and motels, which find it economical to locate in noise-impacted areas, to include noise attenuation considerations in their design and construction.
- Require insulation and other noise control methods in new schools and hospitals consistent with State and federal laws and ordinances.
- Require subdivision applications to provide environmental impact statements containing assessments of noise levels anticipated within the proposed subdivision.

Legislation

- Continue to develop methods for measuring and rating noises in residential, industrial and traffic-impacted areas.
- Conduct community noise surveys as part of each community plan study.

- Require acoustical privacy in new and rehabilitated multi-family dwellings consistent with the State of California Uniform Building Code, 1971, Chapter 14.
- Require that noise from motors, appliances, air conditioners, and other consumer products will not disturb the occupants of surrounding properties.
- Require businesses such as hotels and motels, which find it economical to locate in noise-impacted areas, to include noise attenuation considerations in their design and construction.
- Require insulation and other noise control methods in new schools and hospitals consistent with State and Federal laws and ordinances.
- Require subdivision applications to provide environmental impact statements containing assessments of noise levels anticipated within the proposed subdivision.

Legislation

- Continue to develop methods for measuring and rating noise in residential, industrial and traffic-impacted areas.
- Conduct community noise surveys as part of each community plan study.

- Recommend needed federal and State legislation in the areas of revised motor vehicle noise standards, freeway and highway noise design criteria, noise mitigation and land use sensitivity.

General Programs

- Modify the Noise Ordinance by adding an interior-standards section with the State of California Uniform Building Code, 1973.
- Regulate City property maintenance activities, where feasible, to daylight hours.
- Adopt a City policy to purchase quieter equipment where it is economically justified and establish a method of evaluating bids to give consideration to this, where applicable.
- Strictly enforce all noise standards in the State's Motor Vehicle Code and in other State and federal legislation pertaining to noise sources not regulated directly by City ordinance. The potential offenders include motorcycles, trucks, trains, buses, automobiles, and pleasure vehicles.
- Promote strong acoustical noise and vibration standards for community construction.
- Continue enforcement of noise regulations and standards.
- Encourage industry to implement noise control and abatement and publicize industries' positive efforts towards these goals.

• Recommendations needed Federal and State legislation in the area of revised motor vehicle noise standards, freeway and highway noise design criteria, noise mitigation and land use sensitivity.

General Programs

• Modify the Noise Ordinance by adding an interior standards section with the State of California Uniform Building Code, 1973.

• Repeal City property maintenance activities, where feasible, to daylight hours.

• Adopt a City policy to purchase quieter equipment where it is economically justified and establish a method of evaluating bids to give consideration to this, where applicable.

• Strictly enforce all noise standards in the State's Motor Vehicle Code and in other State and Federal legislation pertaining to noise sources not regulated directly by City ordinance. The potential offenders include motorcycles, trucks, trains, buses, auto-motors, and pleasure vehicles.

• Promote strong community noise and vibration standards for community consideration.

• Continue enforcement of noise regulations and standards.

• Encourage industry to implement noise control and other measures and publicize industry's positive efforts towards these goals.

- Require that City policy encourage all new and redevelopment building projects to provide acoustically adequate building placement and set-backs in site plans.

- Maintain liaison with the County Health Department to remain current on noise problems.

Programs Related to Transportation

- Work with the State Division of Highways to reduce noise intrusion into residential areas by utilizing proper design of barrier construction.
- Plan routes which will insure maximum separation between roadway and existing noise-sensitive areas and which will make maximum use of shielding provided by natural or man-made barriers.
- Construct barriers to obstruct or dissipate sound emissions where possible, and landscape transportation routes with trees, bushes, shrubs, and other flora for partial absorption of noise.
- Maintain liaison with transportation agencies regarding reduction of noise from existing facilities and control of noise through design and location of new facilities.
- Encourage railroad companies to implement policies to reduce noise produced by trains and switching movements, especially near residential areas and during the night.
- Study truck movements for routing along less noise-sensitive routes.

• Require that City policy encourage all new and redevelopment building projects to provide acoustically adequate building placement and setbacks in site plans.

• Maintain liaison with the County Health Department to remain current on noise problems.

Programs Related to Transportation

• Work with the State Division of Highways to reduce noise intrusion into residential areas by utilizing proper design of barrier construction.

• Plan routes which will insure maximum separation between roadway and existing noise-sensitive areas and which will make maximum use of shielding provided by natural or man-made barriers.

• Construct barriers to shield or dissipate sound emissions where possible, and landscape transportation routes with trees, bushes, shrubs, and other flora for partial absorption of noise.

• Maintain liaison with transportation agencies regarding reduction of noise from existing facilities and control of noise through design and location of new facilities.

• Encourage railroad companies to implement policies to reduce noise produced by trains and switching movements, especially near residential areas and during the night.

• Study truck movements for routing along less noise-sensitive routes.

Stipulate that the police enforce existing State Highway noise regulations as well as any additional jurisdictionally adopted noise standards.

Support State and federal airport and aircraft noise legislation.

IMPLEMENTATION

The incorporation of this document into the general planning process will help fulfill the City's goal of creating and maintaining a pleasant environment for its residents and visitors.

Potential Land Use Changes

The following list of noise-impacted areas are considered in need of remedial acoustical treatment either through more compatible land uses, or by encouraging existing property owners to insulate their structures acoustically, where feasible and within the legal bounds of the City.

Area I - Area I, as indicated on the "Noise Impacted Areas" map (Figure 2), is located north of San Fernando Road, south of the City boundary, and one block east of the Golden State Freeway. This area's primary land use consists of single and multiple-family residences. According to the noise survey and State of California freeway noise contours, this area lies within the 70 dBA and 65 dBA noise zones.

Area II - As indicated on the "Noise Impacted Areas" map, this area is located north of Scott Road, south and west of San Fernando Boulevard, and east of the Golden State Freeway. The area's land use is made up of multiple-family low-density residences and falls within the 65 dBA, 70 dBA, and higher unacceptable noise zones.

legislation to the police enforce existing Highway Noise Regulations as well as any additional jurisdictionally adopted noise standards.

Support State and Federal airport and aircraft noise legislation

IMPLEMENTATION

The incorporation of this document into the general planning process will help fulfill the City's goal of creating and maintaining a pleasant environment for its residents and visitors.

Potential Land Use Changes

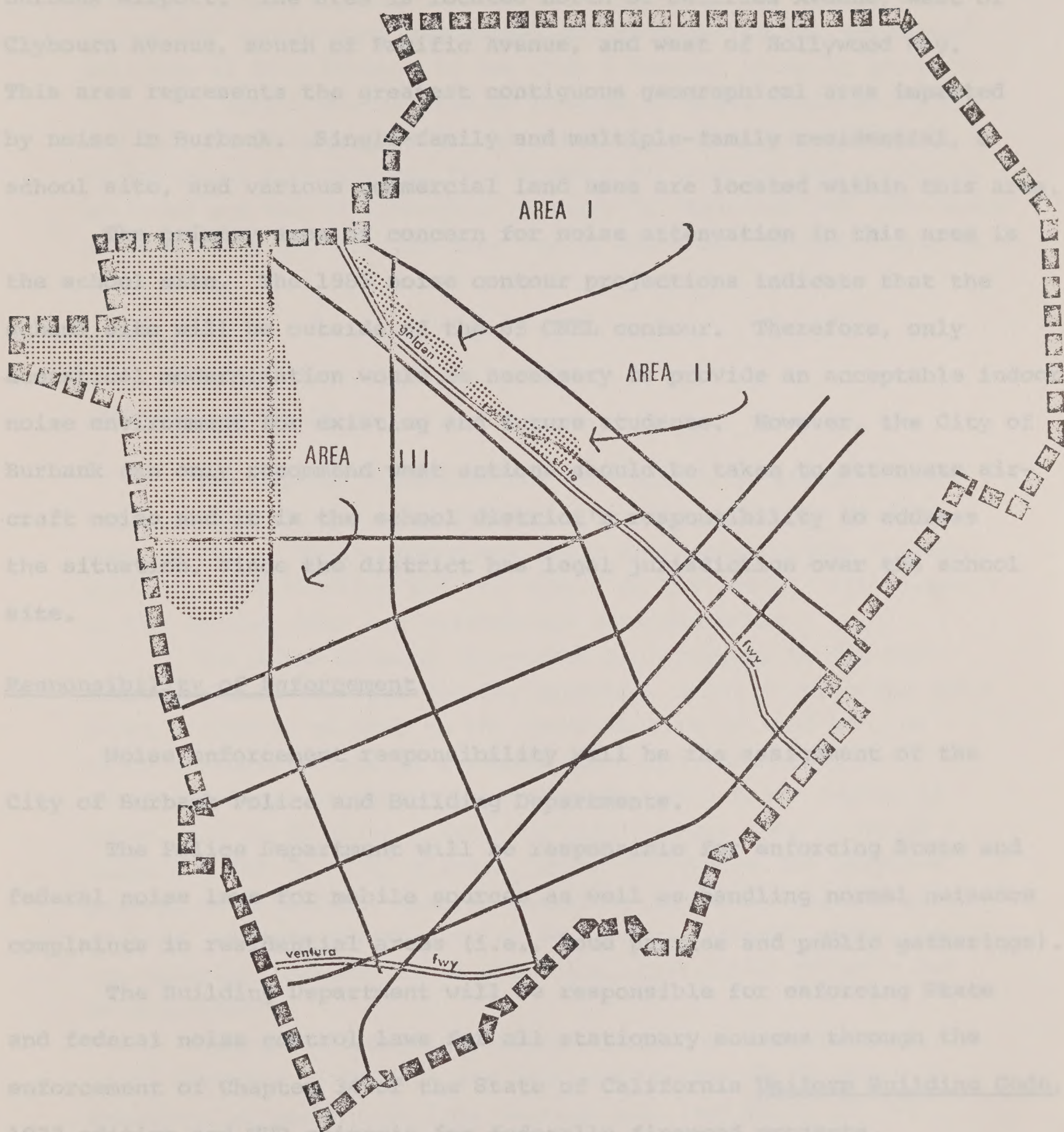
The following list of noise-impacted areas are considered in need of remedial acoustical treatment either through more compatible land uses, or by encouraging existing property owners to insulate their structures acoustically, where feasible and within the legal bounds of the City.

Area I - Area I, as indicated on the "Noise Impacted Areas" map (Figure 2), is located north of San Fernando Road, south of the City boundary, and one block east of the Golden State Freeway. This area's primary land use consists of single and multiple-family residences. According to the noise survey and State of California freeway noise monitoring, this area lies within the 70 dBA and 65 dBA noise zones.

Area II - Area II as indicated on the "Noise Impacted Areas" map, this area is located north of Scott Road, south and west of San Fernando Boulevard and east of the Golden State Freeway. The area's land use is made up of multiple-family low-density residences and falls within the 65 dBA, 70 dBA and higher unacceptable noise zones.

Figure 2

NOISE IMPACTED AREAS





Area III - This area has been described in the existing Noise Environment section as being in the 70 CNEL-contour area of the Hollywood, Burbank Airport. The area is located north of Jeffries Avenue, west of Clybourn Avenue, south of Pacific Avenue, and west of Hollywood Way. This area represents the greatest contiguous geographical area impacted by noise in Burbank. Single-family and multiple-family residential, a school site, and various commercial land uses are located within this area.

The primary area of concern for noise attenuation in this area is the school site. The 1985 noise contour projections indicate that the school site will be outside of the 65 CNEL contour. Therefore, only acoustical modernization would be necessary to provide an acceptable indoor noise environment for existing and future students. However, the City of Burbank can only recommend what actions should be taken to attenuate aircraft noise and it is the school district's responsibility to address the situation, since the district has legal jurisdiction over the school site.

Responsibility of Enforcement

Noise enforcement responsibility will be the assignment of the City of Burbank Police and Building Departments.

The Police Department will be responsible for enforcing State and federal noise laws for mobile sources as well as handling normal nuisance complaints in residential areas (i.e., loud parties and public gatherings).

The Building Department will be responsible for enforcing State and federal noise control laws for all stationary sources through the enforcement of Chapter 34 of the State of California Uniform Building Code, 1973 edition and HUD criteria for federally financed projects.

Area III - This area has been described in the existing Noise Environment section as being in the 70 CNEL-contour area of the Hollywood Burbank Airport. The area is located north of Jelliffe Avenue, west of Cliphurst Avenue, south of Pacific Avenue, and west of Hollywood Way. This area represents the greatest contiguous geographical area impacted by noise in Burbank. Single-family and multiple-family residential, school sites, and various commercial land uses are located within this area. The primary area of concern for noise attenuation in this area is the school site. The 1988 noise contour projections indicate that the school site will be outside of the 65 CNEL contour. Therefore, only acoustical mitigation would be necessary to provide an acceptable noise environment for existing and future students. However, the City of Burbank can only recommend what actions should be taken to attenuate aircraft noise and it is the school district's responsibility to address the situation, since the district has legal jurisdiction over the school site.

Responsibility of Enforcement

Noise enforcement responsibility will be the assignment of the City of Burbank Police and Building Departments. The Police Department will be responsible for enforcing State and federal noise laws for mobile sources as well as handling normal nuisance complaints in residential areas (i.e., loud parties and public gathering). The Building Department will be responsible for enforcing State and federal noise control laws for all stationary sources through the enforcement of Chapter 14 of the State of California Uniform Building Code 1973 edition and HUD criteria for federally financed projects.

The City of Burbank Planning Department has been pressing toward a quieter environment by enforcing the existing zoning and subdivision ordinances and instituting the goals and policies of this Element in the City's General Planning program.

A viable and responsive program of noise attenuation by the City of Burbank will be the result of a continuing program of reviewing and updating this Element as programs and goals are achieved and new technological changes in vehicular and stationary noise sources are brought into law by State and federal agencies.

ANALYSIS

Interrelationships

The General Plan consists of a number of elements which together provide a policy framework for directing the development needed to serve people and their activities within a given political jurisdiction and its sphere of influence. All elements of the General Plan are related and interdependent.

The Noise Element is related most closely to the Circulation, Land Use, and Housing Elements, since it provides noise level standards related to the compatibility of land use, of which residential use is a highly important component. As a chief generator of physical settlements and a major source of noise, the circulation system can play a major role in noise control. The Land Use Element, which designates the proposed general distribution, general location, and extent of the uses of land, relates directly to noise levels. Through proper land use planning, categories of effective noise level criteria can be maintained.

Current scientific evidence indicates that the levels of noise shown in Table 1 are required to provide 96 percent assurance of protection from hearing loss regardless of the period of exposure.

The City of Burbank Planning Department has been pressing towards a quieter environment by enforcing the existing zoning and subdivision ordinances and instituting the goals and policies of this Element in the City's General Planning program. A viable and responsive program of noise attenuation by the City of Burbank will be the result of a continuing program of reviewing and updating this Element as progress and goals are achieved and new technological changes in vehicular and stationary noise sources are brought into law by State and Federal agencies.

ANALYSIS

Interrelationships

The General Plan consists of a number of elements which together provide a policy framework for directing the development needed to serve people and their activities within a given political jurisdiction and its sphere of influence. All elements of the General Plan are related and interdependent.

The Noise Element is related most closely to the City's Land Use, and Housing Elements, since it provides noise level standards related to the compatibility of land use, of which residential use is a highly important component. As a chief generator of physical settlements and a major source of noise, the circulation system can play a major role in noise control. The Land Use Element, which designates the proposed general distribution, general location, and extent of the use of land, relates directly to noise levels. Through proper land use planning, categories of effective noise level criteria can be maintained.

Current scientific evidence indicates that the levels of noise shown in Table I are required to provide 95 percent assurance of protection from hearing loss regardless of the period of exposure.

[Manuscript not available]

The values in the table represent a standard based on what is desirable. No consideration is given to the cost and technological feasibility of these standards. Any trade-off between the cost of implementing these standards in the community and the risk of hearing damage must include consideration of whether the community will compensate the people who may experience hearing loss. If compensation is considered, the problem becomes one of how to determine what the individual's hearing was at the time the standards were put into effect. In controlled situations, it is fairly easy to resolve these issues. In the community, however, it is difficult to identify the cause at a reasonable cost. While little cost analysis is available, it is easy to assume that the cost of implementing the standards and the cost of relaxation could be similar. The major differences would be in whether the monetary responsibility would belong to the industries and their consumers, or to the taxpayers of Burbank. The least involved community position is to use the standards as listed to be the maximum permitted community noise levels.

Community Annoyance and Activity Interference Criteria

Currently, standards 15 dBA lower than those listed in Table 1 ensure highly reliable communication all the time or at reasonable levels of periodic interference. Table 2 shows the community annoyance levels using speech communication criteria as the measure of community interference. For purposes of evaluation, the other periods must be at least 10 dBA down on a continuous basis.

It must be emphasized that Table 2 is based on a documented and predictable test situation. A community still must decide whether interference with speech communication is a reliable measure of annoyance. There is no reliable standard based on measures other than speech interference. The table on page 6 has already shown that at any level of continuous noise,

The values in the table represent a standard based on what is desirable. No consideration is given to the cost and technological feasibility of these standards. Any trade-off between the cost of implementing these standards in the community and the risk of hearing damage must include consideration of whether the community will compensate the people who may experience hearing loss. If compensation is considered, the problem becomes one of how to determine what the individual's hearing was at the time the standards were put into effect. In controlled situations, it is fairly easy to resolve these issues. In the community, however, it is difficult to identify the cause as a reasonable cost. While little cost analysis is available, it is easy to assume that the cost of implementing the standards and the cost of relaxation could be similar. The major difference would be in whether the monetary responsibility would belong to the industries and their customers, or to the taxpayers of Boston. The least resolved community position is to use the standards as listed to be the maximum permitted community noise levels.

Community Annoyance and Activity Interference Criteria

Currently, standards 15 dB lower than those listed in Table 1 ensure highly reliable communication all the time or at reasonable levels of periodic interference. Table 2 shows the community annoyance levels using speech communication criteria as the measure of community interference. For purposes of evaluation, the other periods must be at least 10 dB down on a continuous basis.

It must be emphasized that Table 2 is based on a documented and predictable test situation. A community still must decide whether interference with speech communication is a reliable measure of annoyance. There is no reliable standard based on measures other than speech interference. The table on page 6 has already shown that at any level of continuous noise,

Table 2. COMMUNITY DAYTIME† RESIDENTIAL
NOISE LEVELS REQUISITE TO INSURE
RELIABLE SPEECH COMMUNICATION

A-Weighted Records (dBA)	Maximum Limited† Duration* in a 24-Hour Period	Energy† Equivalent in L_{dn} Units
<u>Hours</u>		
40	24	55
45	24	55
50	24	55
55	24**	55*
60	7.6	55*
<u>Minutes</u>		
65	144	55*
70	45.6	55*
75	14.4	55*
80	4.6	55*
85	1.4	55*
<u>Seconds</u>		
90	27.5	55*
95	8.7	55*
100	2.8	55*
<u>Milliseconds</u>		
10	870	55*
110	280	55*
115	87	55*
120	28	55*

†For indoor standards reduce levels 10 db.

†0700 hours to 2300 hours. Reduce A-weighted levels 10 dB
for nighttime period 2200 hours to 0700 hours.

*Permitted levels above 55 dB assume that noise energy in the
remaining segment of the 24-hours makes an insignificant con-
tribution to the overall exposure. The basic rule is based
on $L_{dn} = 55$ dB.

**Basic rule.

Table 2. COMMUNITY DAYTIME RESIDENTIAL
NOISE LEVELS NECESSARY TO INSURE
RELIABLE SPEECH COMMUNICATION

A-Weighted Records (dB)	Maximum Allowed Exposure* in a 24-Hour Period	Energy Equivalent in dB Units
<u>Hours</u>		
40	24	55
45	24	55
50	24	55
55	24**	55*
60	7.6	55*
<u>Minutes</u>		
65	144	55*
70	45.6	55*
75	14.4	55*
80	4.6	55*
85	1.4	55*
<u>Seconds</u>		
90	27.2	55*
95	8.7	55*
100	2.8	55*
<u>Milliseconds</u>		
110	870	55*
115	260	55*
120	87	55*
125	28	55*

*For indoor standards reduce levels 10 dB.

†0700 hours to 2300 hours. Reduce A-weighted levels 10 dB
for nighttime period 2300 hours to 0700 hours.

*Permitted levels above 55 dB assume that noise energy in the
remaining segment of the 24-hour makes an insignificant con-
tribution to the overall exposure. The basic rule is based
on $L_{eq} = 55$ dB.

**Basic rule.

community reaction will vary by at least one level of intensity. It appears reasonable to modify the levels in Table 2 by 5 dBA. For reference, such a modification would make 45 dBA the permitted 24-hour residential level which is the level reported in the noise ordinance.

Citizen Input and Awareness

An important aspect of the Noise Element of the General Plan is the provision for citizen input and exposure to the problems and issues of noise in their environment. The Burbank Building and Fire Appeals Board consists of appointed citizens who review related building factors and other environmental matters. This board will review all acoustical matters brought before the City for public comment. The Building and Fire Appeals Board will receive staff support from the Police, Building, and Planning departments in their efforts to review and make judgement on those projects which represent potential acoustical annoyance. Review sessions are open to the citizens of Burbank, thus providing them visibility as well as the opportunity to register their opinions on related environmental and acoustical matters before proposals are made into law.

Conclusions

The Noise Element has indicated those areas within the City of Burbank which are impacted by noise related to surface and air transportation systems and stationary sources.

This document has examined other jurisdictional noise ordinances as well as the State and federal laws relating to noise. With this knowledge, the City of Burbank has formulated the goals and policies outlined in this text in order to achieve an acoustical environment that is both healthful and perceptually pleasing.

community reaction will vary by at least one level of intensity. It appears reasonable to modify the levels in Table 2 by 5 dBA. For reference, such a modification would make 45 dBA the permitted 24-hour residential level which is the level reported in the noise ordinance.

Citizen Input and Awareness

An important aspect of the Noise Element of the General Plan is the provision for citizen input and exposure to the problems and issues of noise in their environment. The Burbank Building and Fire Appeals Board consists of appointed citizens who review related building factors and other environmental matters. The board will review all acoustical matters brought before the City for public comment. The Building and Fire Appeals Board will receive staff support from the Police, Building, and Planning departments in their efforts to review and make judgment on those projects which represent potential acoustical annoyance. Review sessions are open to the citizens of Burbank, thus providing them visibility as well as the opportunity to register their opinions on related environmental and acoustical matters before proposals are made into law.

Conclusions

The Noise Element has indicated those areas within the City of Burbank which are impacted by noise related to surface and air transportation systems and stationary sources. This document has examined other jurisdictional noise ordinances as well as the State and Federal laws related to noise. With this knowledge, the City of Burbank has formulated the goals and policies outlined in this text in order to achieve an acoustical environment that is both healthy and peacefully pleasing.

This Element, in concert with the other State-mandated elements of Burbank's General Plan, will help create an environment in which all citizens residing within the City's boundaries will be able to pursue their individual life styles, secure in the knowledge that their City is involved in a continuing process to protect their health, safety, and welfare in the best way possible.

APPROVED BIBLIOGRAPHY

This Element, in concert with the other State-mandated
elements of Burbank's General Plan, will help create an environment
in which all citizens residing within the City's boundaries will
be able to pursue their individual life styles, secure in the
knowledge that their City is involved in a continuing process to
protect their health, safety, and welfare in the best way possible.

ANNOTATED BIBLIOGRAPHY

BACKGROUND ON NOISE PROBLEMS

Background on Noise Problems. December 1977. 17 pp.

ANNOTATED BIBLIOGRAPHY

This report was prepared by Paul S. Vanklamer and Associates for the Airport Land Use Commission to report on the effects of noise on man. The report includes a brief, up-to-date review of the effects of noise on speech, sleep, community reaction, hearing damage, and psychological and physiological studies.

Baker, R. W., et al. A Study of Sensitivity to Noise. Palo Alto: Stanford Research Institute for U.S. Department of Commerce, 1971.

A study of the effects of certain kinds of impulse noise and typical nonimpulse noise upon the psychological and physical behavior of adults.

Beranek, Leo L. (ed.). Noise and Vibration Control. New York: McGraw-Hill, 1971.

Textbook on technical design methods of controlling noise emissions. Considered as one of the basic reference works for acoustical engineers.

Bregman, Clifford R. Noise Pollution - The Unquiet Crisis. 1970.

An excellent and readable book dealing with community noise as a social problem. Definitions of noise as a nuisance and as a hazard. Community noise surveys, with examples of a Philadelphia noise survey. Some solutions for existing noise problems are given.

"Do Motorcyclist Helmets Make Good Hearing Protectors?" Noise and Vibration. January 1974. pp. 30-32.

Sixteen popular helmets were tested for noise attenuation. Except for very high speeds, all helmets were found to provide minimal noise reduction.

ANNOTATED BIBLIOGRAPHY

ANNOTATED BIBLIOGRAPHY

BACKGROUND ON NOISE PROBLEMS

Background on Noise Problems. ALUC. December 1972. 17 pp.

This report was prepared by Paul S. Vaneklasen and Associates for the Airport Land Use Commission to report on the effects of noise on man. The report includes a brief, up-to-date review of the effects of noise on speech, sleep, community reaction, hearing damage, and psychological and physiological states.

Baker, R. W., et al. A Study of Sensitivity to Noise. Menlo Park: Stanford Research Institute (for U.S., Department of Commerce), 1971.

A study of the effects of certain kinds of impulse noise and typical nonimpulse noise upon the psychological and physical behavior of adults.

Beranek, Leo L. (ed.). Noise and Vibration Control. New York: McGraw-Hill, 1971.

Textbook on technical design methods of controlling noise emissions. Considered as one of the basic reference works for acoustical engineers.

Bragdon, Clifford R. Noise Pollution - The Unquiet Crisis, 1970.

An excellent and readable book dealing with community noise as a social problem. Definitions of noise as a nuisance and as a hazard. Community noise surveys, with examples of a Philadelphia noise survey. Some solutions for quieting noise problems are given.

"Do Motorcyclist Helmets Make Good Hearing Protectors?" Sound and Vibration. January 1974. pp. 30-32.

Sixteen popular helmets were tested for noise attenuation. Except for very high speeds, all helmets were found to provide minimal noise reduction.

ANNOTATED BIBLIOGRAPHY

BACKGROUND ON NOISE PROBLEMS

Background on Noise Problems. AINAC. December 1973. 17 pp.

This report was prepared by Paul S. Vannest and Associates for the Airport Land Use Commission to report on the effects of noise on man. The report includes a brief, up-to-date review of the effects of noise on speech, sleep, community reaction, hearing damage, and psychological and physiological states.

Baker, R. W., et al. A Study of Sensitivity to Noise. Natick: Stanford Research Institute (for U.S. Department of Commerce), 1971.

A study of the effects of certain kinds of tonal noise and typical non-tonal noise upon the psychological and physical behavior of adults.

Bernsen, Leo J. (ed.). Noise and Vibration Control. New York: McGraw-Hill, 1971.

Textbook on technical design methods of controlling noise emissions. Considered as one of the basic reference works for acoustical engineers.

Brown, Clifford R. Noise Pollution - The Unquiet Crisis. 1970.

An excellent and readable book dealing with community noise as a social problem. Definitions of noise as a nuisance and as a hazard. Community noise surveys with examples of a Philadelphia noise survey. Some solutions for solving noise problems are given.

"The Acoustical Helmet: Making Good Hearing Protection" Sound and Vibration, January 1974, pp. 30-32.

Sixteen popular helmets were tested for noise attenuation. Except for very high speeds, all helmets were found to provide minimal noise reduction.

Gatley, William S. and Edwin E. Frye. Regulation of Noise in Urban Areas. Rolla: University of Missouri. September 1971.

Comprehensive report dealing with numerous noise factors including: noise legislation; fundamentals of sound and acoustical terminology; criteria for rating sounds; character of urban noise; discussion of noise nuisance ordinance, performance codes, and municipal noise ordinances; regulation of vehicle noise, airport/aircraft noise, and occupational noise; Chicago Noise Ordinance; control of noise through building codes; legal aspects of noise control regulation; requirements for control of urban noise through regulation and planning.

"Hard-Rock Music and Hearing Damage Risk," Sound and Vibration. January 1974. pp. 24-26.

Measured sound levels of rock musical groups showed the need for safeguards. Noise exposure criteria need to be established for hazardous recreational activities as well as for the work place.

"Hearing Loss and Accidents," Sound and Vibration. January 1974. pp. 22-23.

Results of a study indicated that pronounced bilateral, sensori-neural hearing impairment was not a significant contributory factor to the frequency of work-related injuries in long-term employees.

"The Making of a Noise Control Regulation," Sound and Vibration. October 1973. pp. 34-35.

This article describes the historical background which led to the publication by the Federal Highway Administration of "Highway Design Noise Level Standards," and the general intent and content of these regulations.

Quiet City Report. League of California Cities. 28 pp.

This booklet discusses the noise problem in California cities with recommendations to cities to aid in solving community noise problems. It also contains the League's Model Noise Ordinance and a discussion on airport noise.

Barley, William E. and Louis E. Frye. Regulation of Noise in Urban Areas. Rolla: University of Missouri, September 1971.

Comprehensive report dealing with numerous noise factors including: noise legislation; fundamentals of sound and acoustical terminology; criteria for rating sounds; character of urban noise; discussion of noise nuisance ordinance; performance codes; and municipal noise ordinance; regulation of vehicle noise, airport/aircraft noise, and occupational noise; Chicago Noise Ordinance; control of noise through zoning codes; legal aspects of noise control regulation; regulations for control of urban noise through regulation and planning.

"Hard-Back Music and Hearing Damage Risk." Sound and Vibration. January 1974. pp. 24-26.

Measured sound levels of rock musical groups showed the need for safeguards. Noise exposure criteria need to be established for hazardous recreational activities as well as for the work place.

"Hearing Loss and Accidents." Sound and Vibration. January 1974. pp. 21-23.

Results of a study indicated that pronounced bilateral, sensori-neural hearing impairment was not a significant contributory factor to the frequency of work-related injuries in long-term employees.

"The Making of a Noise Control Regulation." Sound and Vibration. October 1973. pp. 24-25.

This article describes the historical background which led to the publication by the Federal Highway Administration of "Highway Noise Level Standards," and the general intent and content of these regulations.

Quiet City Report. League of California Cities. 26 pp.

This booklet discusses the noise problem in California cities with recommendations to cities to aid in solving community noise problems. It also contains the League's Model Noise Ordinance and a discussion on airport noise.

Robinson, D. W. "The Concept of Noise Pollution Level," NPL Aero Report, AC3. Washington, D.C.: National Physical Laboratory, 1969.

Technical paper discussing statistical aspects of transportation noise and their characterization by the mathematical index called the noise pollution index.

"The Rule," Noise and the Engineer. Winter 1974. pp. 13-16.

General discussions about noise pollution and its relationship to engineering, the consumer, the government, and what the engineer can do about the problem.

Russel, M. F. "Reduction of Noise Emissions from Diesel Engine Surfaces." Society of Automotive Engineers Congress. January 1972.

A discussion of design techniques for reducing noise from diesel engines.

Starr, Edward A. "Measuring Noise Pollution," IEEE Spectrum. June 1972.

A "how to" article on ways in which community noise can be measured using equipment generally available in university laboratories.

Transit Planting: A Manual. American Horticultural Society. July 1973.

This manual, prepared for the Urban Mass Transportation Administration, discusses the beautification of transportation areas with trees, shrubs, and ground covers. While this manual may not be valuable in providing for noise reduction by vegetation, the use of vegetation may make sound insulation barriers more attractive.

U.S., Environmental Protection Agency. Effects of Noise on People. Central Institute for the Deaf. December 1971.

This report discusses ear damage and hearing loss; masking and interference with speech and sleep; loudness; perceived and unacceptable noisiness; annoyance and community response; possible psychological and sociological effects and physiological responses; and stress theory of noise on health.

Robinson, G. W. "The Concept of Noise Pollution Level." Aero Report, ACR. Washington, D.C.: National Physical Laboratory, 1959.

Technical paper discussing statistical aspects of transportation noise and their characterization by the mathematical index called the noise pollution index.

"The Noise." Noise and the Engineer. Winter 1974. pp. 13-16.

General discussion about noise pollution and its relationship to engineering, the community, the government, and what the engineer can do about the problem.

Russell, M. F. "Reduction of Noise Emissions from Diesel Engines." Society of Automotive Engineers Congress. January 1972.

A discussion of design techniques for reducing noise from diesel engines.

Stett, Edward A. "Measuring Noise Pollution." IEEE Spectrum. June 1972.

A "how to" article on ways in which community noise can be measured using equipment generally available in university laboratories.

Transit Planning: A Manual. American Horticultural Society. July 1972.

This manual, prepared for the Urban Mass Transportation Administration, discusses the possibilities of landscaping areas with trees, shrubs, and ground covers. While this manual may not be valuable in providing for noise reduction by vegetation, the use of vegetation may make sound insulation barriers more attractive.

U.S. Environmental Protection Agency. Effects of Noise on People. Central Institute for the Deaf. December 1971.

This report discusses ear damage and hearing loss; masking and interference with speech and sleep; loudness; perceived and unacceptable noise; annoyance and community response; possible psychological and sociological effects and physiological responses; and stress theory of noise on health.

U.S., Environmental Protection Agency. The Effects of Sonic Booms and Impulsive Noise on Structures. December 1971.

A brief discussion of the physical nature of sonic booms and other impulse noises and the parameters, such as over-pressure, duration, and mechanical impulse, which characterize sonic booms is presented. This is followed by an overview of the response of structures — particularly buildings — to sonic booms and a review of the damage history summary of the observed effects of impulse noise on terrain and nautral structures.

_____. Fundamentals of Noise: Measurement Rating Schemes, and Standards. National Bureau of Standards. December 1971.

This report is an introduction to noise including the interrelationship between physical measure and psychological responses. It discusses the suitability of various noise exposure rating schemes which are used to predict the effects of noise on man. It discusses hearing damage, communication interference, and other effects of noise.

_____. Laws and Regulatory Schemes for Noise Abatement. December 1971.

An in-depth report into general and specific policies of federal, state, regional, and local noise regulation. Deals with transportation, highway, aviation, occupational, construction, and acoustical characteristics of building noise control. At the State level it discusses the noise sources, with general comments on noise control by the State of California. It also deals with transportation, vehicle operation procedures, commercial, construction, occupational and general disturbance of the peace as well as hunting noise. Local controls, in addition to most of the above categories, also deal with building codes, domestic noise, equipment, and animals.

_____. "Public Health and Welfare Criteria for Noise." July 27, 1973. EPA-550/9-73-002.

Document prepared for Noise Control Act of 1972. Discusses a wide variety of technical relationships between noise and the known effects on human beings. This report provides the basic background for the EPA document, "Recommended Community Noise Levels."

A brief discussion of the physical nature of noise
booms and other impulsive noise and the parameters,
such as over-pressure, duration, and mechanical loading,
which characterize noise booms is presented. This is
followed by an overview of the response of structures
- particularly buildings - to noise booms and a review
of the damage history summary of the observed effects
of impulsive noise on certain and natural structures.

Fundamentals of Noise: Measurement Rating Schemes,
and Standards. National Bureau of Standards, December 1971.

This report is an introduction to noise including the
interrelationship between physical measure and psycho-
logical responses. It discusses the suitability of
various noise exposure rating schemes which are used
to predict the effects of noise on man. It discusses
hearing damage, communication interference, and other
effects of noise.

Laws and Regulatory Schemes for Noise Abatement.
December 1971.

An in-depth report into general and specific policies
of federal, state, regional, and local noise regulation,
deals with transportation, highway, aviation, occupation-
al, construction, and recreational characteristics of
building noise control. At the state level it discusses
the noise sources, with general comments on noise control
by the State of California. It also deals with trans-
portation, vehicle operation procedures, commercial,
construction, occupational and general disturbance of
the peace as well as hearing noise, local controls.
In addition to most of the above categories, also deal
with building codes, domestic noise, equipment, and
animals.

"Public Health and Welfare Criteria for Noise,"
July 27, 1973, EPA-550/8-73-002.

Document prepared for Noise Control Act of 1972. Dis-
cusses a wide variety of technical relationships between
noise and the known effects on human beings. This
report provides the basic background for the EPA docu-
ment, "Recommended Community Noise Levels."

U.S., Environmental Protection Agency. "State and Municipal Non-Occupational Noise Programs." December 1971.

This document, prepared in response to a questionnaire, is a report on state and municipal non-occupational noise abatement and control programs.

U.S., Department of Health, Education, and Welfare. Environmental Health Problems. pp. 14-16.

This article discusses, in a brief manner, the effects of noise on human health and welfare.

Yerges, Lyle F. Sound, Noise, and Vibration Control. 1979. 203 pp.

This book discusses the nature and control of sound; design procedures including site planning, construction, heating, piping, air conditioning, and electrical systems; legal and medical problems.

AIRCRAFT NOISE

"Aircraft Noise Reduction - Alternatives Versus Cost," Sound and Vibration. October 1973. pp. 22-27.

The consequences of implementing alternative engineering and operational strategies for reducing noise around airports are analyzed for 23 U.S. airports. The increased costs involved, the reduction in noise impact areas, and the number of people affected is determined.

Bolt, Beranek and Newman. Aviation Noise Evaluations and Projections - San Francisco Bay Region. August 1971.

This report was prepared as one of the background studies in the ABAG airport study. The report discusses the development of NEF contours as well as other characteristics and problems of airport noise throughout the San Francisco Bay Area.

Community Reaction to Airport Noise. Tracor Document #T "70" AU' 7454'U. National Aeronautics and Space Administration. September 1970.

A statistical study of actual community reaction to airport noise as compared to predicted community reaction.

U.S. Environmental Protection Agency. "State and Municipal Non-Occupational Noise Programs." December 1971.

This document, prepared in response to a questionnaire, is a report on state and municipal non-occupational noise abatement and control programs.

U.S. Department of Health, Education, and Welfare. Mental Health Programs. pp. 14-16.

This article discusses, in a brief manner, the effects of noise on human health and welfare.

Yerkes, Lyle F. Sound, Noise, and Vibration Control. 1979. 103 pp.

This book discusses the nature and control of sound; design procedures including site planning, construction, heating, piping, air conditioning, and electrical systems; legal and medical problems.

AIRCRAFT NOISE

"Aircraft Noise Reduction - Alternatives Versus Cost." Sound and Vibration. October 1973. pp. 22-25.

The consequences of implementing alternative airport noise and operational strategies for reducing noise around airports are analyzed for 22 U.S. airports. The increased costs involved, the reduction in noise impact areas, and the number of people affected is determined.

Hill, Barbara and Newman. Airport Noise Evaluations and Reduction - San Francisco Bay Region. August 1971.

This report was prepared as one of the background studies in the ASAC airport study. The report discusses the development of MIT contours as well as other characteristics and problems of airport noise throughout the San Francisco Bay Area.

Community Reaction to Airport Noise. Transportation Research Board. National Academies and Space Administration. September 1970.

A statistical study of actual community reaction to airport noise as compared to predicted community reaction.

Fry, Robert. "Report on Aircraft and Airport Noise." U.S., Environmental Protection Agency to Congress, 1973.

Summary of EPA findings on airport noise in response to Congressional mandate under Noise Control Act.

Goodman, R. F. Airport Noise and the Changing Patterns of Airport Community Politics. Center for Urban Affairs, USC. February 1972.

A list of land uses around 120 U.S. airports with a rating for the airport in relationship to a series of land use criteria used in the report. Intended primarily to provide some ideas on how airports are using land use control as noise control.

Inglewood, California. Aircraft Noise Abatement Alternatives. September 1971.

This circular contains information on aircraft noise levels and alternatives for reducing those noise levels.

_____. Aircraft Noise Effects on Property Values. February 1972. 2 pp.

This circular contains information relating aircraft noise levels to residential land values and dwelling vacancy rates in the City of Inglewood.

_____. Steep Approaches for Aircraft Noise Abatement. July 1972. 24 pp.

This report compiled and summarized available evidence which indicated that the use of steep approach angles to abate aircraft noise is feasible and safe.

Robin M. Towne and Associates, Inc. Aircraft Noise Study - Naval Air Station, Moffett Field, California. U.S. Navy September 1973. 80 pp.

A Comprehensive report dealing with the aviation noise produced by aircraft using Moffett Field. This report also compares aircraft noise to surface vehicle noise levels in the area encompassed by the noise impact of Moffett Field.

Mr. Robert. "Report on Aircraft and Airport Noise." U.S. Environmental Protection Agency to Congress, 1971.

Summary of EPA findings on airport noise in response to Congressional mandate under Noise Control Act.

Goodman, R. E. Airport Noise and the Changing Patterns of Airport Community Politics. Center for Urban Studies, USC, February 1972.

A list of land uses around 150 U.S. airports with a rating for the airport in relationship to a series of land use criteria used in the report. Intended primarily to provide some ideas on how airports are using land use controls as noise control.

Inglewood, California. Aircraft Noise Abatement Alternatives. September 1971.

This circular contains information on aircraft noise levels and alternatives for reducing those noise levels.

Aircraft Noise Effects on Property Values. February 1972. 2 pp.

This circular contains information relating aircraft noise levels to residential land values and dwelling vacancy rates in the City of Inglewood.

Step Procedures for Aircraft Noise Abatement. July 1972. 14 pp.

This report compiled and summarized available evidence which indicated that the use of steep approach angles to abate aircraft noise is feasible and safe.

Robin M. Towne and Associates, Inc. Aircraft Noise Study - Naval Air Station, Moffett Field, California. U.S. Navy. September 1972. 80 pp.

A Comprehensive report dealing with the aviation noise produced by aircraft using Moffett Field. This report also compares aircraft noise to surface vehicle noise levels to the area encompassed by the noise impact of Moffett Field.

Transportation Consultants, Inc. Compatible Land Use Planning on and Around Airports. Federal Aviation Agency. NTIS. June 1966.

A scholarly investigation of the effect of local action on the mitigation of airport noise problems. Considers the implications that groups benefited by mitigation measures frequently obtain the benefits at the expense of others.

U.S., Department of Housing and Urban Development. Aircraft Noise Impact: Planning Guidelines for Local Agencies. November 1972. 274 pp.

A report helpful in defining noise problems caused by aircraft. It discusses options for reducing noise conflicts, the development of a planning program for aircraft noise abatement, and the future of noise abatement policies.

U.S., Department of Transportation and Department of Housing and Urban Development. Aircraft Noise and Airport Neighbors: A Study of Logan International Airport. Report No. DOT/HUD INAP-70-1. Washington, D.C.: Government Printing Office. 1970.

A case study of the communities around Logan Airport. The area, which is divided into a number of small townships, has a history of community problems.

Wilsey and Ham. The Effect of Aviation on Physical Environmental and Land Uses in the Bay Area. Regional Airport Systems Study. 1971.

A comprehensive evaluation of environmental impact in the Bay Area including the Santa Clara Valley. Describes future expected environmental impacts.

GROUND-TRANSPORTATION NOISE

Bolt, Beranek and Newman. Fundamentals and Abatement of Highway Traffic Noise. U.S., Department of Transportation. May 1973.

A textbook prepared as a training course directed toward the two procedures currently used for predicting and abating highway noise. They are: (1) the National

Transportation Consultants, Inc. Compatible Land Use Planning
on and Around Airports. Federal Aviation Agency. WIS.
June 1966.

A scholarly investigation of the effect of local
action on the mitigation of airport noise problems.
Considers the implications that groups benefited by
mitigation measures frequently obtain the benefits at
the expense of others.

U.S., Department of Housing and Urban Development. Airport
Noise Impact: Planning Guidelines for Local Agencies.
November 1972. 274 pp.

A report helpful in defining noise problems caused by
aircraft. It discusses options for reducing noise con-
ditions, the development of a planning program for air-
craft noise abatement, and the future of noise abate-
ment policies.

U.S., Department of Transportation and Department of Housing
and Urban Development. Airport Noise and Airport Neigh-
bors. A Study of Local International Airport. Report
DOT/FAA/ENR-70-1. Washington, D.C.: Government
Printing Office. 1970.

A case study of the communities around Logan Airport.
The area, which is divided into a number of small
townships, has a history of community problems.

Wilsey and Ham. The Effect of Aviation on Physical Environ-
mental and Land Use in the New Area. Technical Report
Systems Study. 1971.

A comprehensive evaluation of environmental impact
in the Bay Area including the Santa Clara Valley.
Describes future expected environmental impacts.

GROUND-TRANSPORTATION NOISE

Holt, Bornick and Newman. Transportation and Environment of High-
way Traffic Noise. U.S., Department of Transportation.
May 1972.

A textbook prepared as a training course directed toward
the two procedures currently used for predicting and
abating highway noise. They are: (1) the National

Cooperative Highway Research Program's 117 Method; and (2) the TSC method, a computer method devised by the Transportation Systems Center. This textbook was used by the State of California Highway Department to prepare highway contours for Santa Clara County.

Bolt, Beranek and Newman. Highway Noise: A Design Guide for Highway Engineers. National Cooperative Highway Research Program. 1971. 79 pp.

A manual prepared by the National Cooperative Research Program. Develops the 117 System for preparing highway noise contours.

California, Division of Highways. Traffic Noise Near Highways: Testing and Evaluation. January 1973. 35 pp.

A method for measuring and evaluating noise adjacent to highways is described. Also presented is a quick and simple method for determining the noise reduction offered by noise barriers of varying height, from a cross section, and the use of a noise nomograph, as an aid in barrier design.

Donovan, Jerry and Tom Ketcham. "Transportation Noise - Its Measurement and Evaluation," Sound and Vibration. Vol. 7, No. 10. October 1973.

A short article on the techniques used for measurement and reduction of noise measurement data accumulated during field surveys.

"Instrumentation Topics," Sound and Vibration. October 1973. pp. 4-16.

This article deals with transportation noise, its measurement, and evaluation.

Kryter, Karl D. The Effects of Noise on Man. 1970. 663 pp.

This book presents a critical, historical analysis of relevant literature, and offers new or modifies existing techniques for the evaluation of the effects of environmental noise on man. The book discusses effects of noise on speech communications, making of sound, damage risk from exposure to noise, procedures for estimating damage risk to hearing and perceived noisiness

Cooperative Highway Research Program's 117 Method; and
(2) the 120 method, a computer method devised by the
Transportation Systems Center. This textbook was
used by the State of California Highway Department to
prepare highway contours for Santa Clara County.

Bolt, Bernard and Newman. Highway Noise: A Design Guide for
Highway Engineers. National Cooperative Highway Research
Program, 1971. 72 pp.

A manual prepared by the National Cooperative Research
Program. Develops the 117 system for preparing high-
way noise contours.

California, Division of Highways. Traffic Noise Near Highways:
Testing and Evaluation. January 1973. 22 pp.

A method for measuring and evaluating noise adjacent
to highways is described. Also presented is a quick
and simple method for determining the noise reduction
offered by noise barriers of varying height. From a
cross section, and the use of a noise nomograph, as an
aid in barrier design.

Bonovant, Jerry and Tom Ketcham. "Transportation Noise -- Its
Measurement and Evaluation." Sound and Vibration, Vol. 7,
No. 10, October 1973.

A short article on the techniques used for measurement
and reduction of noise measurement data accumulated
during field surveys.

"Instrumentation Topics." Sound and Vibration. October 1973.
pp. 4-16.

This article deals with transportation noise, its
measurement, and evaluation.

Kryter, Karl D. The Effects of Noise on Man. 1970. 663 pp.

This book presents a critical, historical analysis of
relevant literature, and offers new or modified exist-
ing techniques for the evaluation of the effects of
environmental noise on man. The book discusses effects
of noise on speech communication, hearing of sound,
sleeps risk from exposure to noise, procedures for
estimating damage risk to hearing and perceived noisiness

(annoyance). The book also discusses environmental noise and its evaluation, including motor vehicle noise, aircraft noise, and regulatory codes for community noise. The physiological responses discussed are somatic response, stress and health, sleep, audio analgesia, and the effects on other senses and motor performance.

Lyon, Richard J. Transportation Noise. Massachusetts: Grozier Publishing. 1973.

Textbook containing a series of lectures on the technical aspects of transportation noise.

Paullin, Robert L. and Harvey B. Safeer. Motor Vehicle Noise Generation and Potential Abatement. Automotive Engineering Congress, Detroit. January 1972. Washington, D.C.: Office of the Secretary of Transportation.

Technical paper presented by General Motor's staff on the aspects of research into noise control. The authors suggest that control techniques will produce only minor reduction in automobile noise.

Safeer, Harvey B. and Barry F. Kneer. Community Sound Levels. Arlington, Virginia: U.S., Department of Transportation. Serendipity, Inc.

A computer study of a typical location near a typical highway provides information on the relationship of group models to real highway environs.

Socio-Economic Considerations in Transportation Planning. Highway Research Record 3-5. Highway Research Board, 1970.

A collection of papers on the ways in which ground transportation affects the community. Included are many references to noise.

"Technical Basis for Motor Carrier and Railroad Noise Regulations," Sound and Vibration. October 1973. pp. 28-33.

Technical considerations behind the interstate motor carrier and railroad noise regulations proposed by the EPA are reviewed in light of the EPA Task Force findings and subsequent analysis of the authors.

Technical considerations behind the interstate motor carrier and railroad noise regulations proposed by the EPA are reviewed in light of the EPA Task Force findings and subsequent analysis of the authors.

"Technical Basis for Motor Carrier and Railroad Noise Regulations," Sound and Vibration, October 1973, pp. 28-33.

A collection of papers on the ways in which ground transportation affects the community. Included are many references to noise.

Socio-Economic Considerations in Transportation Planning, Highway Research Record 3-2, Highway Research Board, 1970.

A computer study of a typical location near a typical highway provides information on the relationship of group models to real highway systems.

Saleer, Harvey S. and Harry F. Ewert, Community Sound Levels, Arlington, Virginia: U.S. Department of Transportation, Serenipity, Inc.

Technical paper presented by General Motors' staff on the aspects of research into noise control. The authors suggest that control techniques will produce only minor reduction in automobile noise.

Paulin, Robert B. and Harvey S. Saleer, Motor Vehicle Noise Generation and Radiated Attenuation, Automotive Engineering Congress, Detroit, January 1971, Washington, D.C.: Office of the Secretary of Transportation.

Textbook containing a series of lectures on the technical aspects of transportation noise.

Lyon, Richard J., Transportation Noise, Massachusetts: Griffin Publishing, 1973.

(anonymous). The book also discusses environmental noise and its evaluation, including motor vehicle noise, aircraft noise, and regulatory codes for community noise. The physiological responses discussed are somatic responses, stress and health, sleep, and analysis, and the effects on other senses and motor performance.

U.S., Department of Transportation. A Study of the Magnitude of Transportation Noise, Generation, and Potential Abatement. Arlington, Virginia: Serendipity, Inc., 1970.

A six-volume set, each one dealing with a specific aspect of transportation noise, including highway, railway, air, and other related topical areas. An excellent technical reference work.

_____. Transportation Noise and Its Control. June 1972.
27 pp.

A booklet for the layman on transportation noise. Discusses basic concepts and abatement measures in a way that is useful for the nontechnical person.

Wyle Laboratories. Assessment of Noise Environment Around Railroad Operations. Report WCR 73-5. July 1973.

A technique document for computing the impact of railroad operations. Includes many charts, graphs and mathematical formulae depicting railroad noise in several operational conditions, but most notably, switching operations.

_____. Transportation Noise and Noise from Equipment Powered by Internal Combustion Engines. U.S., Environmental Protection Agency. December 1971. 273 pp.

This report discusses noise from commercial aircraft, V/STOL aviation, general aviation aircraft highway vehicles, rail systems, and recreational vehicles.

THE SOCIAL IMPACT OF NOISE EFFECTS ON HUMANS

Bottom, C. G. and D. M. Waters. A Social Survey into Annoyance Caused by the Interaction of Aircraft and Traffic Noise. TT7102. Loughborough, England: Loughborough University of Technology.

One of several English studies that have served as a basis for relating community reactions to levels of community exposure. More extensive than most others because it considers ground-related traffic.

U.S., Department of Transportation. A Study of the Magnitude of Transportation Noise, Generation, and Potential Mitigation. Arlington, Virginia: General Dynamics, Inc., 1970.

A six-volume set, each one dealing with a specific aspect of transportation noise, including highway, railway, air, and other related topical areas. An excellent technical reference work.

Transportation Noise and Its Control. June 1972.

27 pp.

A booklet for the layman on transportation noise. Discusses basic concepts and abatement measures in a way that is useful for the nontechnical person.

Wyke Laboratories. Assessment of Noise Environment Around Rail-Road Operations. Report WLP 13-2, July 1973.

A technical document for comparing the impact of rail-road operations. Includes many charts, graphs and mathematical formulas depicting railroad noise in several operational conditions, not most notably, switching operations.

Transportation Noise and Noise from Equipment Powered by Internal Combustion Engines. U.S., Environmental Protection Agency. December 1971. 273 pp.

This report discusses noise from commercial aircraft, V/STOL aviation, general aviation aircraft, highway vehicles, rail systems, and recreational vehicles.

THE SOCIAL IMPACT OF NOISE EFFECTS ON HUMANS

Boston, E. G. and D. M. Waters. A Social Survey into Annoyance Caused by the Interaction of Aircraft and Traffic Noise. Loughborough, England: Loughborough University of Technology.

One of several English studies that have served as a basis for relating community reactions to levels of community exposure. More extensive than most others because it considers ground-related factors.

U.S., Environmental Protection Agency, National Bureau of Standards. The Social Impact of Noise. NTID300.11. Washington, D.C.: Government Printing Office, 1971.

A qualitative discussion of the variety of current opinions on the effects of noise on social behavior. Discussed are some of the reactions of business, and public relationships to the influence of noise.

THE EFFECTS OF NOISE ON ANIMALS AND WILDLIFE

U.S., Department of Agriculture, Soil Conservation Service. Monitoring Noise Levels (Safety and Health 26). April 1973. 3 pp.

A letter which discusses the Agriculture Department's safety and health requirements. Attached is a form used to develop noise monitoring levels.

U.S., Environmental Protection Agency. Effects of Noise on Wildlife and Other Animals. December 1971. 74 pp.

A report which discusses the effects of noise on laboratory animals, farm animals, and wildlife.

INDUSTRIAL NOISE

"Isograms Show Sound-Level Distributions in Industrial Noise Studies," Sound and Vibration. November 1973. pp. 12-17.

An article which presents a procedure for analysis and display of the noise level data acquired during an acoustical survey of industrial facilities. Can be used to identify a plant's noise exposure patterns.

"General Motor's Noise Control Program," Sound and Vibration. November 1973. pp. 29-31.

A description of General Motors Corporation's comprehensive, in-plant noise control program developed to protect the hearing of their employees and to meet regulatory requirements.

U.S., Environmental Protection Agency, National Bureau of Standards, The Social Impact of Noise, NBS-100, 11, Washington, D.C., Government Printing Office, 1971.

A qualitative discussion of the variety of current opinions on the effects of noise on social behavior. Discussed are some of the reactions of workers and public relationships to the influence of noise.

THE EFFECTS OF NOISE ON ANIMALS AND WILDLIFE

U.S., Department of Agriculture, Soil Conservation Service, Monitoring Noise Levels (Safety and Health 35), April 1973, 3 pp.

A letter which discusses the Agriculture Department's safety and health requirements. Attached is a form used to develop noise monitoring levels.

U.S., Environmental Protection Agency, Effects of Noise on Wildlife and Other Animals, December 1971, 75 pp.

A report which discusses the effects of noise on laboratory animals, farm animals, and wildlife.

INDUSTRIAL NOISE

"Programs Show Sound-Level Distribution in Industrial Noise Studies," Noise and Vibration, November 1973, pp. 12-17.

An article which presents a procedure for analyzing and display of the noise level data collected during an acoustical survey of industrial facilities. Can be used to identify a plant's noise exposure patterns.

"General Motor's Noise Control Program," Noise and Vibration, November 1973, pp. 29-31.

A description of General Motors Corporation's comprehensive, in-plant noise control program developed to protect the hearing of their employees and to meet regulatory requirements.

L. S. Goodfield Associates. Noise from Industrial Plants.
December 1971. 302 pp.

A report which includes field survey results from various types of plants such as glass and can manufacturers, oil refineries, power plants, and automobile assembly plants. The impact of industrial-plant sources are related to the work and community environment. Also discussed are attitudes toward noise legislation, noise-reduction programs, and industrial plants and noise abatement technological assessment.

BUILDING CODES AND SOUND BARRIERS

"Architectural Products Preview," Sound and Vibration. September 1973. pp. 10-14.

Discusses the concept of using sound-absorptive wall design and lead roofing as sound barriers.

Bolt, Beranek and Newman. Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances. U.S., Environmental Protection Agency. December 1971. 188 pp.

A report which discusses the character of construction equipment, home appliances, and building equipment noises, their impact and the efforts of industry to improve these noise problems.

California, Division of Highways. Can Noise Radiation from Highways be Reduced by Design? January 1968.

A report which discusses the problems of unmodified highway designs, and how modified highway design can allow for better noise reduction. The properties of materials for use as noise shields, examples of good and bad highway shielding, benefits derived from planting, and the reduction of noise at the source also are discussed.

Design Data, Fire Resistance. Published by Gypsum Association.

A basic reference document for builders showing the fire resistance, sound transportation rating and

A report which includes field survey results from various types of plants such as glass and can manufacturing, all commercial power plants, and auto-mobile assembly plants. The impact of industrial plant noises are related to the work and community environment. Also discussed are attitudes toward noise legislation, noise-reduction programs, and industrial plants and noise abatement technological assessment.

BUILDING CODES AND SOUND BARRIERS

"Architectural Trends Review," Sound and Vibration, September 1973, pp. 13-14.

Discusses the concept of using sound-reflective wall design and lead roofing as sound barriers.

Bolt, Bernard and Newman, Noise from Construction Equipment and Operations, Building Department, and Home Appliances, U.S. Environmental Protection Agency, December 1971, 106 pp.

A report which discusses the character of construction equipment, home appliances, and building equipment noise, their impact and the efforts of industry to improve these noise problems.

California, Division of Highways, Can Noise Radiation from Highways be Reduced by Design, January 1968.

A report which discusses the problems of proposed highway design, and how modified highway design can allow for better noise reduction. The properties of materials for use as noise shields, examples of good and bad highway shielding barriers derived from planting, and the reduction of noise at the source also are discussed.

Design Data, Fire Resistance, Published by Systems Association.

A basic reference document for builders showing the fire resistance, sound transmission rating and

construction forms for a large number of combinations of gypsum wallboard, fiberglass and stud arrangements.

"Designing Glass Units for Sound Reduction," Sound and Vibration. September 1973. pp. 38-39.

Laminated and double-glazed glass units provide improved acoustical performance over monolithic units. Basic guidelines for designing glass units with predictable acoustical ratings are presented.

"Improved Acoustical Privacy in Multi-Family Dwellings," Sound and Vibration. September 1973. pp. 30-37.

Acoustical privacy between adjoining spaces in a multi-family dwelling involves the related concepts of acoustical flanking, the level of noise in the receiving room, and the response of the listener.

Inglewood, California. Environmental and Economic Analysis of an Acoustical Treatment Ordinance. June 1972.

A report which analyzes the environmental and economic factors associated with the adoption of the acoustical treatment (soundproofing) ordinance proposed for the aircraft noise zones in Inglewood.

"Low-Cost Acoustical Enclosures for a Wood Planer," Sound and Vibration. November 1973, pp. 34-38.

A lumber mill wood planer was enclosed to reduce noise exposure of operators to acceptable values.

Uniform Building Code. 1973 Ed. Sacramento: State Publishing Office. 1973.

Chapter 35 of the Uniform Building Code gives noise insulation standards.

Wyle Laboratories. A Guide to Soundproofing of Existing Homes Against Exterior Noise. Report No. WCR 70-2. Los Angeles. 1970.

Contains architectural diagrams and instructions for construction of various wall and floor panels as well as sound-transmission-class ratings for cases discussed.

transmitted forms for a large number of complaints
of typical wallboard, fiberglass and wood arrangements.

"Designing Glass Walls for Sound Reduction," Sound and Vibration, September 1973, pp. 25-29.

Partially and double-glazed glass units provide
improved acoustical performance over non-glazed units.
Basic guidelines for designing glass units with pre-
dictable acoustical ratings are presented.

"Improved Acoustical Privacy in Multi-Family Dwellings," Sound and Vibration, September 1973, pp. 30-37.

Acoustical privacy between adjoining spaces in a
multi-family dwelling involves the related concepts
of structural flanking, the level of noise in the
receiving room, and the response of the listener.

Engineering, California, Environmental and Building Institute of
an Acoustical Treatment, Volume 1, June 1973.

A report which analyzes the environmental and economic
factors associated with the adoption of the acoustical
treatment (soundproofing) standards proposed for the
critical noise zones in California.

"Low-Frequency Acoustical Enclosures for a Wood Printer," Sound and Vibration, November 1973, pp. 34-38.

A printer with wood platen was enclosed to reduce
noise exposure of operators to acceptable values.

Uniform Building Code, 1973 Ed., Sacramento: State Publishing
Office, 1973.

Chapter 35 of the Uniform Building Code gives noise
insulation standards.

Wyle Laboratories, A Guide to Soundproofing of Existing Rooms
Against Exterior Noise, Report No. W-10-2, Los Angeles,
1970.

Control of acoustical disturbance and transmission for
construction of various wall and floor panels as well as
sound-transmission-class ratings for cases discussed.

FEDERAL AND STATE REGULATIONS

Federal Register. Vol. 37, Nos. 202 and 243. October and December 1972.

Included in these issues are occupational noise exposure standards which discuss the duration of permissible noise exposure levels as well as hearing protection requirements of the federal government.

"Proposed Occupational Safety and Health Administration Noise Regulations," Sound and Vibration. November 1973. pp. 24-28.

Proposed occupational noise regulations are presented as revised by the Occupational Safety and Health Administration, Standards Advisory Committee on Noise. The proposed regulations are prefaced by critical comments by authorities.

U.S., Department of Housing and Urban Development. Noise Abatement and Control: Department of Policy, Implementation Responsibilities, and Standards. 1390.2 September 1971.

This circular establishes noise exposure policies and standards to be observed in the approval or disapproval of all HUD projects.

_____. Noise Assessment Guidelines. August 1971. 20 pp.

This booklet provides a procedure which may be used to assess exposure of housing to present and future noise conditions. These conditions include aircraft, roadway and railroad noise.

U.S., Environmental Protection Agency. Office of Noise Abatement and Control. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. Draft No. 2. Washington, D.C.: Government Printing Office.

This document provides the basis upon which the EPA believes communities should base local standards and criteria for noise abatement and control.

Federal Register, Vol. 37, Nos. 202 and 243, October and December 1972.

Included in these issues are occupational noise exposure standards which discuss the duration of exposure, noise exposure levels as well as hearing protection requirements of the Federal Government.

"Proposed Occupational Safety and Health Administration Noise Regulations," Sound and Vibration, November 1973, pp. 28-38.

Proposed occupational noise regulations are presented as revised by the Occupational Safety and Health Administration, Standards Advisory Committee on Noise. The proposed regulations are preceded by critical comments by authorities.

U.S. Department of Housing and Urban Development, Noise Abatement and Control: Department of Policy, Information, and Standards, 1970-2, September 1971.

This circular establishes noise exposure policies and standards to be observed in the approval or disapproval of all HUD projects.

Noise Assessment Guidelines, August 1971, 20 pp.

This booklet provides a procedure which may be used to assess exposure of housing to present and future noise conditions. These conditions include aircraft, roadway and railroad noise.

U.S. Environmental Protection Agency, Office of Noise Abatement and Control, Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, Draft No. 1, Washington, D.C.: Government Printing Office.

This document provides the basis upon which the EPA believes communities should base local standards and criteria for noise abatement and control.

U.S., Environmental Protection Agency. Summary of Noise Programs in the Federal Government. December 1971.

The activities of various federal agencies involved in noise abatement and control are discussed. The agencies primarily responsible for noise control are Defense, NASA, HEW, HUD, and EPA. The extent of the authority and impact upon the field of noise abatement and control of these agencies is outlined.

_____. Technology and Economics of Noise Control: National Programs and their Relationship with State and Local Programs. November 1971. 515 pp.

A collection of statements from public hearings on noise abatement and control conducted by the EPA. Contains a section on truck tire noise. (p. 365)

LOCAL REGULATIONS

Bragdon, Clifford R. "Municipal Noise Ordinances," Sound and Vibration. Vol. 7, No. 12. December 1973.

Compilation of the standards in a number of municipal noise ordinances used throughout the U.S.

Mountain View, City of. Noise Element. March 1973.

Palo Alto, City of. Noise Element. November 1972.

San Diego, County of. Noise Element. 1974.

Santa Fe Springs, City of. Noise Element. 1973.

Saratoga, City of. Noise Element. November 1972.

U.S. Environmental Protection Agency. Summary of Noise Pro-
grams in the Federal Government. December 1971.

The activities of various federal agencies involved in
noise abatement and control are discussed. The agencies
primarily responsible for noise control are Defense,
NASA, HSW, HUD, and EPA. The extent of the authority
and impact upon the field of noise abatement and con-
trol of these agencies is outlined.

Technology and Economics of Noise Control. National
Programs and their Relationship with State and Local Pro-
grams. November 1971. 215 pg.

A collection of statements from public hearings on
noise abatement and control conducted by the EPA.
Contains a section on track line noise. (p. 352)

LOCAL REGULATIONS

Braden, Clifford R. "Municipal Noise Ordinances." Sound and
Vibration. Vol. 7, No. 12. December 1973.

Compilation of the standards in a number of municipal
noise ordinances used throughout the U.S.

Mountain View, City of. Noise Element. March 1973.

Palo Alto, City of. Noise Element. November 1973.

San Diego, County of. Noise Element. 1974.

Santa Fe Springs, City of. Noise Element. 1973.

Sarasota, City of. Noise Element. November 1973.

Citizen Attitudes About Urban Issues

Sample social study of Mashville, Tennessee, in which the public attitude about schools, housing, services, public facilities, and plan services are surveyed. Contains observations on community noise.

Galloway, William J. and Dwight E. Bishop. Noise Exposure Forecasts, Evolution, Evaluation and Extensions and Land Use Interpretations. Van Nuys: Department of Transportation, 1970.

One of the original attempts to relate the concept of daily noise exposure to acceptable land uses. This methodology still is widely used in airport analyses.

League of California Cities. League Model Noise Ordinance. Sacramento: State Publishing Office. 1970.

A model ordinance suggested for use in California cities. Covers most basic aspects of regulations currently of interest.

Sieveking, N. S. Urban Observatory of the University of Tennessee. Prepared for the U.S., Department of Housing and Urban Development. June 1974.

Tracor, Inc. Guidelines on Noise. Medical Research Report EA 7301. American Petroleum Institute.

A specialized document relating primarily to individual noise control techniques. Principally for products in the petroleum industry.

U.S., Environmental Protection Agency. Urban Planning, Architectural Design, and Noise in the Home. August 197. 174 pp.

A collection of statements from public hearings conducted by the EPA on noise abatement and control. These hearings dealt mainly with urban planning, architectural design, and noise in the home.

Citizen Attitudes About Urban Noise

Sample social study of Nashville, Tennessee, in which the public attitudes about schools, housing, services, public facilities, and plan services are surveyed. Contains observations on community noise.

Galloway, William D. and Dwight N. Bishop. Noise Exposure Factors: Evaluation, Prediction and Extension and Land Use Information. Van Nuys: Department of Transportation, 1970.

One of the original attempts to relate the concept of daily noise exposure to acceptable land use. This methodology still is widely used in airport analysis.

League of California Cities. League Model Noise Ordinance. Sacramento: State Publishing Office, 1970.

A model ordinance suggested for use in California cities. Covers most basic aspects of regulations currently of interest.

Shawking, M. S. Urban Observatory of the University of Toronto. Prepared for the U.S. Department of Housing and Urban Development. June 1970.

Treco, Inc. Guidelines on Noise. Medical Research Report. American Petroleum Institute.

A specialized document relating primarily to individual noise control techniques. Principally for products in the petroleum industry.

U.S. Environmental Protection Agency. Urban Planning, Architectural Design, and Noise in the Home. August 1971. 174 pp.

A collection of statements from public hearings conducted by the EPA on noise abatement and control. These hearings dealt mainly with urban planning, architectural design, and noise in the home.

COMMUNITY NOISE

Branch, Melville C. Outdoor Noise and the Metropolitan Environment. Los Angeles: Department of City Planning. 1970.

A document which provides an understanding of the scope of noise intrusions into the Los Angeles Basin. Easily understood by laymen with many interesting graphical portraits of noise impact.

Inglewood, California. Community Noise Study - Inglewood. 1972.

Measurement of 35 locations throughout the City of Inglewood on a 24 hour basis.

Parker, P. J., et al. "London Noise Survey," Building Research Station Report. London: HMSO, 1968.

Comprehensive survey of noise in the London area. Provides interest and comparison for similar-sized U.S. cities.

U.S., Department of Housing and Urban Development. Noise in Urban and Suburban Areas: Results of Field Studies. Washington, D.C.: Government Printing Office. 1967.

A series of recordings in various community locations provides some basis for judging the adequacy of the Housing and Urban Development noise assessment guidelines.

Wyle Laboratories. Community Noise. U.S., Environmental Protection Agency. December 1971.

This report describes the outdoor noise environment, intruding noises, community reaction to and growth of noise pollution.

Green, Melville C. "Good Noise and the Metropolitan Area -
Report, Los Angeles: Department of City Planning, 1970.

A document which provides an understanding of the
 scope of noise intrusions into the Los Angeles
 Basin. Easily understood by laymen with many inter-
 esting graphical portrayals of noise impact.

Inglwood, California. Community Noise Study - Interim
 1972.

Measurement of 35 locations throughout the City of
 Ingleside on a 24 hour basis.

Parsons, E. J., et al. "London Noise Survey," Building Research
Station Report, London: HMSO, 1968.

Comprehensive survey of noise in the London area.
 Provides interest and comparison for similar-sized
 U.S. cities.

U.S. Department of Housing and Urban Development. Noise in
Urban and Suburban Areas: Results of Field Studies.
 Washington, D.C.: Government Printing Office, 1967.

A series of photographs in various community locations
 provided some basis for judging the severity of the
 housing and other background noise assessment guide-
 lines.

Wyle Laboratories. Community Noise. U.S., Environmental Pro-
 tection Agency. December 1971.

This report describes the outdoor noise environment,
 including noise, community reaction to and growth of
 noise pollution.

NOISE ENFORCEMENT

Heath, Warren M. California's Experience in Vehicle Noise Enforcement. California Highway Patrol. May 1972.
26 pp.

A report which discusses California's Highway Patrol experience in enforcement of vehicle noise problems.

Appendix A

TECHNICAL DISCUSSION OF NOISE

Appendix A

TECHNICAL DISCUSSION OF NOISE

Appendix A

TECHNICAL DISCUSSION OF NOISE

Appendix A

TECHNICAL DISCUSSION OF NOISE

Not a day goes by in which people are not bombarded by a multitude of sound in an urban environment. Many of these sounds are desirable and necessary for day to day activities, but unfortunately, most sounds such as vehicular, aircraft, industrial, and air conditioning units are undesirable and can also be detrimental to health.

Since the advent of the industrial age, the urban environment has been increasingly exposed to the by-products of technology, namely air and water pollution. Recently noise has emerged as the third major pollutant. It invades all areas and aspects of the environment. For example, the neighbor with the power lawn mower, the teenager with the motorcycle, and the barking dog all testify to this intrusion of privacy.

Solutions to the noise problem may seem simple at first glance, but upon further examination it can be seen that abatement is an extremely complex endeavor. First, there is a problem in the identification of the noise source. Most sources are identified as nuisances to the community, but noise is unwanted sound and therefore subject to individual likes and dislikes.

Second, there is the problem of noise measurement. Acoustical engineers have solved this problem with the utilization of metering devices to measure the level of sound. The most widely used metering device is the "A-weighted" sound level meter (dBA). Basically, this instrument simply measures the sound pressure from a noise sources and is set up with a filter to respond to the sound energy the same as a normal human ear.

Appendix A

TECHNICAL DISCUSSION OF NOISE

Not a day goes by in which people are not bothered by a multitude of sound in an urban environment. Many of these sounds are desirable and necessary for day activities, but unfortunately, most sounds such as vehicular, aircraft, industrial, and air conditioning units are undesirable and can also be detrimental to health.

Since the advent of the industrial age, the urban environment has been increasingly exposed to the by-products of technology, namely air and water pollution. Recently noise has emerged as the third major pollutant. It invades all areas and aspects of the environment. For example, the neighbor with the power lawn mower, the teenager with the motorcycle, and the parking lot all testify to this invasion of privacy.

Solutions to the noise problem may seem simple at first glance, but upon further examination it can be seen that abatement is an extremely complex endeavor. First, there is a problem in the identification of the noise source. Most sources are identified as nuisances to the community, but noise is unwanted sound and therefore subject to individual likes and dislikes.

Second, there is the problem of noise measurement. Acoustical engineers have solved this problem with the utilization of metering devices to measure the level of sound. The most widely used metering device is the "A-weighted" sound level meter (SLM). Basically, this instrument simply measures the sound pressure from a noise source and is set up with a filter to respond to the sound energy the same as a normal human ear.

The standard unit of measurement is called decibels and is used to designate varying levels of sound. The human ear can detect sounds varying up to 10,000,000,000,000 dB. The use of measurement units on this magnitude would be unmanageable, therefore, decibels are based on a logarithmic scale. For example, a jet flyover at 1,000 feet (102 dBA) is eight times as loud as a vacuum cleaner (70 dBA), rather than one-quarter greater as the number would appear to indicate. (See Table A-1 on the following page.)

Third, one of the greatest problems in noise analysis is relating noise exposure to community health and welfare, and determining adequate maximum noise levels for the protection of the citizens well being. Though there has been some dispute in the scientific community regarding the detrimental effect of noise, specific conclusions in some areas of noise effects have been reached.

Physiological

Hearing loss is directly related to the extent of exposure to sound levels and to the period of time. A temporary loss of hearing is a frequent occurrence in our urban environment. Exposure to such common noise sources as power tools (100 dBA), rock-n-roll music (110 dBA), and food blenders (88 dBA) can cause a temporary impairment to normal hearing for a period as short as 1 hour or as long as several days. Extremely loud noises of a short duration can result in the same phenomenon, and is usually characterized by a ringing sensation in the ear.

Permanent hearing loss can arise if an individual is continuously exposed to moderate to high noise levels (comparable to those cited above) over a given period of time.¹ Such incidences commonly occur and are well documented in occupational, industrial settings.

¹Continuous exposure consists of a daily exposure for several hours over a minimum of 1 year.

The standard unit of measurement is called decibels and is used to designate varying levels of sound. The human ear can detect sounds varying up to 10,000,000,000 dB. The use of measurement units on this magnitude would be impractical, therefore, decibels are based on a logarithmic scale. For example, a jet airplane at 1,000 feet (102 dB) is eight times as loud as a vacuum cleaner (70 dB), rather than one-quarter greater as the number would appear to indicate. (See Table A-1 on the following page.)

Third, one of the greatest problems in noise analysis is relating noise exposure to community health and welfare, and determining appropriate maximum noise levels for the protection of the citizens well being. Though there has been some dispute in the scientific community regarding the detrimental effect of noise, scientific conclusions in some areas of noise effects have been reached.

Physiological

Hearing loss is directly related to the extent of exposure to sound levels and to the period of time. A temporary loss of hearing is a frequent occurrence in our urban environment. Exposure to such common noise sources as power tools (100 dB), rock-n-roll music (110 dB), and food blenders (95 dB) can cause a temporary impairment to normal hearing for a period as short as 1 hour or as long as several days. Extremely loud noises of a short duration can result in the same phenomenon and is usually characterized by a ringing sensation in the ear. Permanent hearing loss can arise in an individual who continuously exposed to moderate to high noise levels (comparable to those cited above) over a given period of time.¹ Such incidences commonly occur and are well documented in occupational industrial settings.

¹Continuous exposure consists of a daily exposure for several hours over a minimum of 1 year.

Table 1.

Sound Levels and Loudness of Illustrative Noises in Indoor and Outdoor Environments
(A-Scale Weighted Sound Levels¹)

dB(A) ²	OVER-ALL LEVEL (Sound Pressure Level Approx. 0.0002 Microbar)	COMMUNITY (Outdoor)	HOME OR INDUSTRY (Indoor)	LOUDNESS (Human Judgment of Different Sound Levels)
130				
120	UNCOMFORTABLY	Military Jet Aircraft Take-Off With After-Burner From Aircraft Carrier @ 50 Ft. (130)	Oxygen Torch (121) ³	120 dB(A) 32 Times As Loud
110	LOUD	Turbo-Fan Aircraft @ Take-Off Power @ 200 Ft. (118) ⁴	Riveting Machine (110) Rock-N-Roll Band (108-114)	↑ 110 dB(A) 16 Times As Loud
100	VERY	Jet Flyover @ 1000 Ft. (103) Boeing 707, DC-8 @ 6080 Ft. Before Landing (106) ⁵ Bell J-2A Helicopter @ 100 Ft. (100) ⁶		100 dB(A) 8 Times As Loud
90	LOUD	Power Mower (96) Boeing 737, DC-9 @ 6080 Ft. Before Landing (97) ⁵ Motorcycle @ 25 Ft. (90)	Newspaper Press (97)	90 dB(A) 4 Times As Loud
80		Car Wash @ 20 Ft. (89) ⁷ Prop. Plane Flyover @ 1000 Ft. (88) Diesel Truck, 40 MPH @ 50 Ft. (84) Diesel Train, 45 MPH @ 100 Ft. (83)	Food Blender (88) Milling Machine (85) Garbage Disposal (80)	80 dB(A) 2 Times As Loud
70	MODERATELY LOUD	High Urban Ambient Sound (80) Passenger Car, 65 MPH @ 25 Ft. (77) Freeway @ 50 Ft. from Pavement Edge, 10 A.M. (76±6) ⁷	Living Room Music (76) TV-Audio, Vacuum Cleaner (70)	70 dB(A)
60		Air Conditioning Unit @ 100 Ft. (60)	Cash Register @ 10 Ft. (65-70) ⁷ Electric Typewriter @ 10 Ft. (64) ⁷ Dishwasher (Rinse) @ 10 Ft. (60) ⁷ Conversation (60)	60 dB(A) 1/2 As Loud
50	QUIET	Large Transformers @ 100 Ft. (50)		50 dB(A) 1/4 As Loud
40		Bird Calls (44) ⁷ Lower Limit, Urban Ambient Sound (40)		40 dB(A) 1/8 As Loud
30	JUST AUDIBLE	[db(A) Scale Interrupted]		
10				
0	THRESHOLD OF HEARING			

*Reproduced from Melville C. Branch and R. Dale Beland,
Outdoor Noise in the Metropolitan Environment, published
by the City of Los Angeles, 1970, p. 2.

Table 1.

Source Levels and Loudness of Illustrative Noises in Indoor and Outdoor Environments
(A-Weighted Sound Levels)

dB(A)	ENVIRONMENTAL	COMMUNITY	HOME OR INDUSTRY	LOCATIONS
120	INCONVENIENT	Many activities in home and office, e.g., vacuuming, washing machine, etc.	City street, 100 ft.	120-125 dB(A) 7-10 ft. A-weighted
115	LOUD	Typical average in home and office, e.g., vacuuming, washing machine, etc.	City street, 100 ft.	110-115 dB(A) 7-10 ft. A-weighted
110		Typical average in home and office, e.g., vacuuming, washing machine, etc.	City street, 100 ft.	105-110 dB(A) 7-10 ft. A-weighted
105	VERY	Typical average in home and office, e.g., vacuuming, washing machine, etc.	City street, 100 ft.	100-105 dB(A) 7-10 ft. A-weighted
100	LOUD	Typical average in home and office, e.g., vacuuming, washing machine, etc.	City street, 100 ft.	95-100 dB(A) 7-10 ft. A-weighted
95		Typical average in home and office, e.g., vacuuming, washing machine, etc.	City street, 100 ft.	90-95 dB(A) 7-10 ft. A-weighted
90		Typical average in home and office, e.g., vacuuming, washing machine, etc.	City street, 100 ft.	85-90 dB(A) 7-10 ft. A-weighted
85		Typical average in home and office, e.g., vacuuming, washing machine, etc.	City street, 100 ft.	80-85 dB(A) 7-10 ft. A-weighted
80	Moderately	Typical average in home and office, e.g., vacuuming, washing machine, etc.	City street, 100 ft.	75-80 dB(A) 7-10 ft. A-weighted
75	LOUD	Typical average in home and office, e.g., vacuuming, washing machine, etc.	City street, 100 ft.	70-75 dB(A) 7-10 ft. A-weighted
70		Typical average in home and office, e.g., vacuuming, washing machine, etc.	City street, 100 ft.	65-70 dB(A) 7-10 ft. A-weighted
65		Typical average in home and office, e.g., vacuuming, washing machine, etc.	City street, 100 ft.	60-65 dB(A) 7-10 ft. A-weighted
60		Typical average in home and office, e.g., vacuuming, washing machine, etc.	City street, 100 ft.	55-60 dB(A) 7-10 ft. A-weighted
55		Typical average in home and office, e.g., vacuuming, washing machine, etc.	City street, 100 ft.	50-55 dB(A) 7-10 ft. A-weighted
50	QUIET	Typical average in home and office, e.g., vacuuming, washing machine, etc.	City street, 100 ft.	45-50 dB(A) 7-10 ft. A-weighted
45		Typical average in home and office, e.g., vacuuming, washing machine, etc.	City street, 100 ft.	40-45 dB(A) 7-10 ft. A-weighted
40		Typical average in home and office, e.g., vacuuming, washing machine, etc.	City street, 100 ft.	35-40 dB(A) 7-10 ft. A-weighted
35		Typical average in home and office, e.g., vacuuming, washing machine, etc.	City street, 100 ft.	30-35 dB(A) 7-10 ft. A-weighted
30		Typical average in home and office, e.g., vacuuming, washing machine, etc.	City street, 100 ft.	25-30 dB(A) 7-10 ft. A-weighted
25		Typical average in home and office, e.g., vacuuming, washing machine, etc.	City street, 100 ft.	20-25 dB(A) 7-10 ft. A-weighted
20		Typical average in home and office, e.g., vacuuming, washing machine, etc.	City street, 100 ft.	15-20 dB(A) 7-10 ft. A-weighted
15		Typical average in home and office, e.g., vacuuming, washing machine, etc.	City street, 100 ft.	10-15 dB(A) 7-10 ft. A-weighted
10		Typical average in home and office, e.g., vacuuming, washing machine, etc.	City street, 100 ft.	5-10 dB(A) 7-10 ft. A-weighted
5		Typical average in home and office, e.g., vacuuming, washing machine, etc.	City street, 100 ft.	0-5 dB(A) 7-10 ft. A-weighted
0	THRESHOLD OF HEARING			

*Reproduced from Melville C. Branch and A. Dale Sanford,
Outdoor Noise in the Metropolitan Environment, published
by the City of Los Angeles, 1970, p. 2.

Once the hearing mechanism is permanently damaged, it cannot regenerate, thus, deafness is not a recoverable illness. Hearing aids can offer some help, but unfortunately they merely increase the level of sound and do not compensate for distortions to discrete sounds.

Noise may also cause physiological alterations other than just to the ear. Brief intense sounds over 70 decibels can manifest changes in the smooth muscles and glands which can affect an individual's heartbeat, alter breathing, constrict blood vessels and affect digestion. While such effects have been observed, conclusions have not been documented.

Sleep Interference

Environmental noise can affect the ability to get to sleep and remain in various stages of sleep. Regardless of age, studies have indicated that adaptation to sleep interference is virtually nonexistent. Additionally, if sleep disturbances are persistent enough to cause sleep loss, it can eventually lead to a general decline of both the psychological and physiological status of human beings.

Speech/Communication Interference

Interference with speech is perhaps the most noticeable affect of noise impact. Background noise in urban communities (90 dB) can sometimes reach levels five times as loud as normal conversation (60 dB) and may make communications all but impossible. (See Figure A-1 on the following page.)

This masking effect (the drawing out of less intense sound by more intense sound) explains why certain sounds such as the ticking of a clock are perceptible in relatively quiet environments and unnoticeable in noisier ones, and conversely

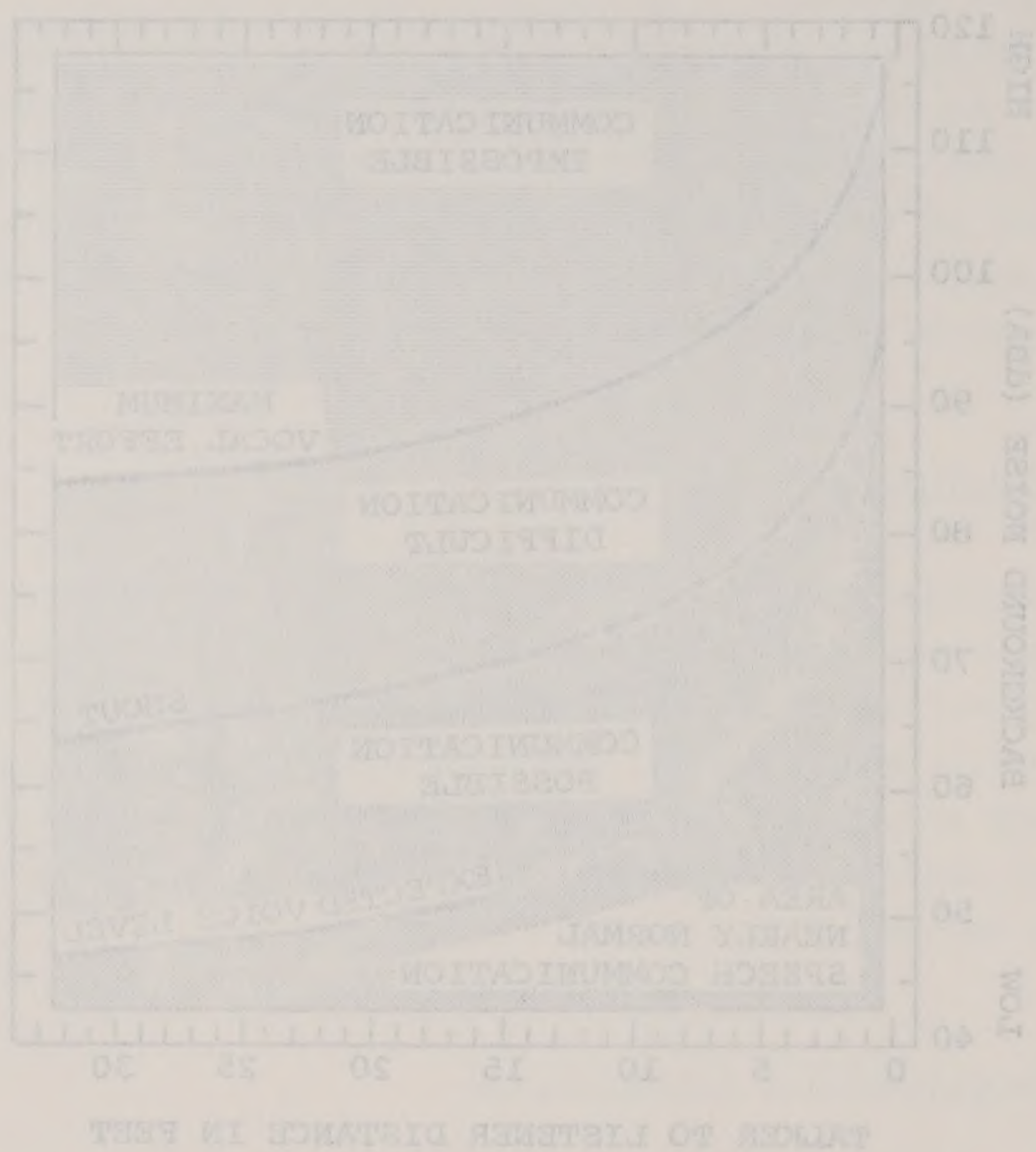


Figure 1.
QUALITY OF SPEECH COMMUNICATION IN RELATION TO
DISTANCE BETWEEN THE TALKER AND THE LISTENER.

why extremely loud noise sources such as a motorcycles (90 dBA) appear quieter in an urban setting (70 dBA) than in a quiet residential community (40 dBA). All people have experienced speech interferences at one time or another such as when a passing vehicle or airplane makes speech communication all but impossible for a short period of time. Both the old and the young are especially subject to speech interferences but for different reasons. The old have usually suffered some hearing loss over the years and consequently have trouble defining certain sound levels. Conversely, small children have difficulty understanding adults because they have not yet learned to distinguish between the sounds of words and environmental noise.

Annoyance

As previously stated, noise is unwanted sound. People may be adversely affected by noise due to their individual perception of varying patterns, frequency, time of occurrence and levels of sounds.

Psychologists and psychiatrists have conducted extensive research in the area of sound annoyance and have concluded that a continuous level of sound or impulse over various relative time periods can cause adverse psychological responses ranging from pleasure to fear and unconscious disruptions of the nervous system.

The most annoying documented aspect of noise is the interference of normal television viewing. The second most annoying situation is the interference of speech, both in the home and outside situations (i.e., schools and offices) as discussed above. Beyond the more conscious noise annoyance factors, it has been observed that noise can create anxiety, depression, and general disorientation due to continued mental annoyance by unwanted noise.

Why extremely loud noise sources such as a motorcycle (90 dBA) appear quieter in an urban setting (70 dBA) than in a quiet residential community (40 dBA). All people have experienced speech interferences at one time or another such as when a passing vehicle or airplane makes speech communication all but impossible for a short period of time. Both the old and the young are especially subject to speech interferences but for different reasons. The old have usually suffered some hearing loss over the years and consequently have trouble defining certain sound levels. Conversely, small children have difficulty understanding adult language they have not yet learned to distinguish between the sounds of words and environmental noise.

Annoyance

As previously stated, noise is unwanted sound. People may be adversely affected by noise due to their individual perception of varying patterns, frequency, time of occurrence and levels of sounds. Psychologists and psychiatrists have conducted extensive research in the area of sound annoyance and have concluded that a continuous level of sound or impulse over various relative time periods can cause adverse psychological responses ranging from pleasure to fear and unconscious disruptions of the nervous system. The most annoying documented aspect of noise is the interference of normal relaxation viewing. The second most annoying situation is the interference of speech, both in the home and outside situations (i.e., schools and offices) as discussed above. Beyond the more conscious noise annoyance factors, it has been observed that noise can create anxiety, depression, and general dissatisfaction due to continued mental annoyance by unwanted noise.

Structural Effects

Sonic booms can have a severe affect to structures causing damage to windows and plaster, however, these impacts can usually be controlled within urban areas as not to produce any environmental affects. Vibrations to fragile structures can be caused by large trucks, trains, and heavy construction, though such occurences are rare and damage is normally slight. Sonic booms and vibrations to structures are secondary affects of noise and can frequently produce startle, temporary discomfort and annoyance to individuals.

Seismic booms can have a severe effect on structures causing damage to windows and plaster. These impacts can usually be controlled within urban areas as not to produce any environmental effects. Vibrations to fragile structures can be caused by large bridges, trains, and heavy construction. Though such occurrences are rare and damage is normally slight. Seismic booms and vibrations to structures are secondary effects of noise and can frequently produce acute, temporary discomfort and annoyance to individuals.

Appendix B

FEDERAL AND STATE NOISE STANDARDS

Appendix B

FEDERAL AND STATE NOISE STANDARDS

The Federal and State governments have established noise guidelines and regulations for the purpose of protecting citizens from potential hearing damage and various other adverse physiological, psychological, and social effects associated with noise.

The first Federal efforts regulating noise were issued by the Department of Labor in 1969 establishing noise as an occupational health hazard. As a result, two legislative acts have been enacted that regulate noise from industrial fixed-point sources resulting in hearing loss. The Walsh-Healey Public Contracts Act as amended includes provisions for occupational noise regulations. Failure by a corporation to comply with the established standards set forth in the corporation's removal from a list of eligible suppliers for Federal contracts.

The Occupational Safety and Health Act (OSHA) of 1970 sets noise exposure standards as follows for all businesses engaged in interstate commerce:

Table 1. PERMISSIBLE NOISE EXPOSURE

Duration, Hours Per Day	Sound Level dBA
8	90
6	92
4	95
3	97
2	100
1	105

Appendix 2

FOOTNOTES AND STATE
HOUSE STAFFS

Appendix B

FEDERAL AND STATE NOISE STANDARDS

The federal and State governments have established noise guidelines and regulations for the purpose of protecting citizens from potential hearing damage and various other adverse physiological, psychological, and social effects associated with noise.

The first federal efforts regulating noise were issued by the Department of Labor in 1969 establishing noise as an occupational health hazard. As a result, two legislative acts have been enacted that regulate noise from industrial fixed-point sources resulting in hearing loss. The Walsh-Healey Public Contracts Act as amended includes provisions for occupational noise regulations. Failure by a corporation to comply with the established standards may result in the corporation's removal from a list of bidders eligible for federal contracts.

The Occupational Safety and Health Act (OSHA) of 1970 sets noise exposure standards as follows for all businesses engaged in interstate commerce:

Table 2. PERMISSIBLE NOISE EXPOSURES

Duration, Hours Per Day	Sound Level dBA
8 - - - - -	90
6 - - - - -	92
4 - - - - -	95
3 - - - - -	97
2 - - - - -	100
1 - - - - -	105

FEDERAL AND STATE NOISE STANDARDS

The Federal and State governments have established noise guidelines and regulations for the purpose of protecting citizens from potential hearing damage and various other adverse physiological, psychological, and social effects associated with noise.

The first Federal efforts regarding noise were issued by the Department of Labor in 1969 establishing noise as an occupational health hazard. As a result, two legislative acts have been enacted that regulate noise from industrial fixed-point sources resulting in hearing loss. The Walsh-Healey Public Contracts Act as amended includes provisions for occupational noise reductions. Failure by a corporation to comply with the established standards may result in the corporation's removal from a list of bidders eligible for Federal contracts. The Occupational Safety and Health Act (OSHA) of 1970 sets noise exposure standards as follows for all businesses engaged in interstate commerce:

Table 1. RECOMMENDED NOISE EXPOSURES

Duration, Hours Per Day	Sound Level, dBA
8	90
6	92
4	95
3	97
2	100
1	105

In 1972, Congress enacted the Noise Control Act. This act authorized the Environmental Protection Agency (EPA) to publish descriptive data on the effects of noise and establish levels of noise "requisite to protect the public health and welfare with an adequate margin of safety." These levels are separated into health (hearing loss levels) and welfare (annoyance levels) as follows:

Table 3. SUMMARY OF NOISE LEVELS REQUISITE
TO PROTECT PUBLIC HEALTH AND WELFARE

Effect	Level
Hearing Loss	70 dB ¹
Outdoor activity interference and annoyance	55 dB ²
Indoor activity interference and annoyance	45 dB ²

¹Averaged over a 24-hour period.

²Averaged over a 24-hour period with a 10-dB nighttime (10:00 p.m. to 7:00 a.m.) weighting.

The levels are designed to ensure reliable speech communication at about 5 feet in the outdoor environment. The EPA cautions that their identified levels are not standards because they do not take into account the cost or feasibility of the levels. The EPA concludes that 24-hour continuous noise levels should be below 70 dBA to minimize the risk of hearing loss. For outdoor and indoor environments, interference with activity and annoyance will not occur if levels do not exceed 55 dBA and 45 dBA, respectively.

The Federal Highway Administration (FHWA) and the Department of Housing and Urban Development (HUD) are two federal agencies that have established noise level criteria for various

In 1972, Congress enacted the Noise Control Act. This act authorized the Environmental Protection Agency (EPA) to publish descriptive data on the effects of noise and establish levels of noise "adequate to protect the public health and welfare with an adequate margin of safety." These levels are separated into hearing loss levels (hearing loss levels) and annoyance (annoyance levels) as follows:

Table 1. SUMMARY OF NOISE LEVELS RECOMMENDED TO PROTECT PUBLIC HEALTH AND WELFARE

Level	Effect
70 dBA ¹	Hearing loss
55 dBA ²	Outdoor activity interference and annoyance
45 dBA ²	Indoor activity interference and annoyance

¹ Averaged over a 24-hour period.

² Averaged over a 24-hour period with a 10-15 nighttime (10:00 p.m. to 7:00 a.m.) weighting.

The levels are designed to ensure reliable speech communication at about 5 feet in the outdoor environment. The EPA cautions that these identified levels are not standards because they do not take into account the cost or feasibility of the levels. The EPA concludes that 24-hour continuous noise levels should be below 70 dBA to minimize the risk of hearing loss. For outdoor and indoor environments, interference with activity and annoyance will not occur if levels do not exceed 55 dBA and 45 dBA, respectively.

The Federal Highway Administration (FHWA) and the Department of Housing and Urban Development (HUD) are two federal agencies that have established noise level criteria for various

types of land use. The FHWA has established noise standards for land use criteria for use in the planning and designing of highways as shown in Table 4.

Table 4. DESIGN NOISE LEVEL/LAND USE RELATIONSHIPS

Noise Level (dBA) ¹	Description of Land
60 (Exterior)	Tracts of land in which serenity and quiet are of extraordinary significance and serve an important public need - i.e., amphitheaters, parks and open space.
70 (Exterior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, picnic areas, recreation areas, playgrounds, active sport areas, and parks.
75 (Exterior)	Developed lands not included in the above categories.
55 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums.

¹Maximum continuous noise level permitted 90 percent of the time during the day.

Exterior noise levels apply to outdoor areas which have regular human use and in which a lowered noise level would be of benefit. The noise level values need not be applied to areas having limited human use or where lowered noise levels would produce little benefit. The indoor level relates to indoor activities where no exterior noise-sensitive land use or activity is identified.

types of land use. The FHWA has established noise standards for land use criteria for use in the planning and designing of highways as shown in Table 4.

Table 4. DESIGN NOISE LEVEL AND THE RELATIONSHIPS

Designation of Land	Noise Level (dBA)
Tracts of land in which extremely and quiet are of extraordinary significance and serve an important public need - i.e., airports, theaters, parks and open spaces.	60 (Exterior)
Residences, hotels, hospitals, public meeting rooms, schools, churches, libraries, hospitals, picnic areas, recreation areas, playgrounds, active sport areas, and parks.	70 (Exterior)
Developed lands not included in the above categories.	75 (Exterior)
Residences, hotels, hospitals, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.	55 (Interior)

Maximum continuous noise level permitted 90 percent of the time during the day.

Exterior noise levels apply to outdoor areas which have regular human use and in which a lowered noise level would be of benefit. The noise level values need not be applied to areas having limited human use or where lowered noise levels would produce little benefit. The indoor level relates to indoor activities where no exterior noise-sensitive land use or activity is identified.

HUD has established policies for granting financial support for the construction of residential dwellings in noise-impacted areas as shown below:

Table 5. EXTERNAL NOISE EXPOSURE
STANDARDS FOR NEW CONSTRUCTION

<u>Acceptable</u>	- Does not exceed 45 dBA more than 30 minutes per 24 hours.
<u>Discretionary</u>	- Normally acceptable - does not exceed 65 dBA more than 8-hours per 24 hours.
<u>Discretionary</u>	- Normally - unacceptable - exceeds 65 dBA 8 hours per 24 hours.
<u>Unacceptable</u>	- Exceeds 80 dBA 60 minutes per 24 hours. Exceeds 75 dBA 8 hours per 24 hours.

Any noise environment that exceeds 65 dBA for 8 hours per day is considered normally unacceptable and requires certain measures to reduce noise levels in the living quarters. Also, noise reduction methods need to be presented to the Regional Administrator of the Federal Housing Authority (FHA) for approval before financial assistance or support is granted. Beyond these requirements, HUD personnel at the local level must assess the acceptability of noise exposure in indoor sleeping areas. These areas are considered acceptable if the noise levels:

...do not exceed 55 dBA for more than ...
60 minutes in any 24-hour period and do
not exceed 45 dBA for more than 30 minutes ...
from 11:00 p.m. to 7:00 a.m. and do not
exceed 45 dBA for more than ... 8 hours in
any 24-hour day.

HUD has established policies for granting financial support for the construction of residential dwellings in noise-impacted areas as shown below:

Table 2. INTERNAL NOISE EXPOSURE STANDARDS FOR NEW CONSTRUCTION

<u>Acceptable</u>	- Does not exceed 45 dBA more than 30 minutes per 24 hours.
<u>Discretionary</u>	- Normally acceptable - does not exceed 65 dBA more than 8-hours per 24 hours.
<u>Discretionary</u>	- Normally - unacceptable - exceeds 65 dBA 8 hours per 24 hours.
<u>Unacceptable</u>	- Exceeds 60 dBA 60 minutes per 24 hours, exceeds 75 dBA 8 hours per 24 hours.

Any noise environment that exceeds 65 dBA for 8 hours per day is considered normally unacceptable and requires certain measures to reduce noise levels in the living quarters. Also, noise reduction methods need to be presented to the Regional Administrator of the Federal Housing Authority (FHA) for approval before financial assistance or support is granted. Beyond these requirements, HUD personnel at the local level must assess the acceptability of noise exposure in indoor sleeping areas. These areas are considered acceptable at the noise levels:

...do not exceed 55 dBA for more than 60 minutes in any 24-hour period and do not exceed 45 dBA for more than 30 minutes ... from 11:00 p.m. to 7:00 a.m. and do not exceed 45 dBA for more than ... 8 hours in any 24-hour day.

A general comparison of Federal Noise Standards is shown in Table 6. These standards are shown for a maximum recommended per 24-hour period although levels may be exceeded for shorter periods of time. However, these higher levels must be offset by even quieter levels of noise the remaining period of time.

The State of California has also adopted noise standards in areas of regulation not pre-empted by the federal government. State standards regulate noise levels of motor vehicles, establish noise impact boundaries around airports, and set noise insulation standards as shown in Table 7.

Table 6. GENERAL COMPARISON OF FEDERAL NOISE STANDARDS

Adjusted Sound Pressure Level, dBA	Maximum Recommended Duration for		Description
	Industrial Vehicle	Health Standard	
45			Industrial
50			Industrial
55			Industrial
60			Industrial
65			Industrial
70			Industrial
75			Industrial
80			Industrial
85			Industrial
90			Industrial

A general comparison of Federal Noise Standards is shown in Table 6. These standards are shown for a maximum 24-hour period although levels may be exceeded for shorter periods of time. However, these higher levels must be offset by even quieter levels of noise the remaining period of time.

The State of California has also adopted noise standards in areas of regulation not pre-empted by the Federal government. State standards regulate noise levels of motor vehicles, establish noise impact boundaries around airports, and set noise insulation standards as shown in Table 7.

Table 6. GENERAL COMPARISON OF FEDERAL NOISE STANDARDS

A-Weighted Sound Pressure Level dBA	Maximum Recommended Duration for 24-Hour Period				
	OSHA Industrial Limits	EPA Limits		HUD Limits (Exterior)	FHWA Limits (Exterior)
		Health	Annoyance		
45			Indoor	Acceptable	
50					
55			Outdoor		
60					Public Open Space
65				Discretionary	
70		Hearing Loss			Residential, etc.
75					Other Devel- oped Lands
80					
85	Permissible			Unacceptable	
90				Unacceptable	

Table 7. STATE OF CALIFORNIA NOISE STANDARDS

Description	Noise Standards (dBA values at 50 feet unless noted otherwise)		
	Effective Date	35 MPH or less	Over 35 MPH
Operation of vehicles at posted speeds:			
1. Motorcycle		82	86
2. Vehicle with a GVW of 6000 lb. or more (or combination)	Before 1/1/73	88	90
	After 1/1/73	86	90
3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle		76	82
Sale of new vehicles			
1. Motorcycles manufactured	Before 1970		92
2. Motorcycles, other than motor driven cycles manufactured	After '69, Before '73		88
	After '72, Before '75		86
	After '74, Before '78		80
	After '77, Before '88		75
	After '87		70
3. Vehicle with a GVW of 6000 lb. or more	After '67, Before '73		88
	After '72, Before '75		86
	After '74, Before '78		83
	After '77, Before '88		80
	After '87		
4. Any other motor vehicle	After '67, Before '73		86
	After '72, Before '75		84
	After '74, Before '78		80
	After '77, Before '88		75
	After '87		
Noise level limits for the operation of off highway motor vehicles	Any vehicle manufac- tured on or after 1/1/72 before 1/1/73		92
	after 1/1/73 before 1/1/75		88
Establish Noise Impact Boundary around airports	(in CNEL units at ground level)		
New Airports	65 dB		
Existing large airports	Before 1/1/76	80 dB	
	After 1/1/76	75 dB	
	After 1/1/81	70 dB	
	After 1/1/81	65 dB	
Existing small airports	Before 1/1/76	70 dB	
	After 1/1/81	65 dB	
Noise Insulation Standards	(in CNEL units)		
	45 dB interior		
	60 dB or greater		
	requires analysis		

CNEL = Community Noise Equivalent Level

Noise Insulation Standards		Description	
(in CNEI units) 45 dB interior 50 dB or greater requires analysis		Established Noise Impact Boundary around airports New Airports Existing large airports Existing small airports	Noise level limits for the operation of off highway motor vehicles
(in CNEI units) 65 dB Before 1/1/75 After 1/1/75 65 dB Before 1/1/75 After 1/1/75 65 dB	(in CNEI units) 65 dB Before 1/1/75 After 1/1/75 65 dB Before 1/1/75 After 1/1/75 65 dB	4. Any other motor vehicle	3. Vehicle with a GVW of 6000 10. or more
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles manufactured after 1/1/75 3. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more	2. Motorcycles, other than motor driven cycles manufactured before 1/1/75
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	4. Any other motor vehicle	1. Motorcycles 2. Vehicle with a GVW of 6000 10. or more 3. Any other motor vehicle and any combination of motor vehi- cles towed by such vehicle
88 84 80 75	After '87 After '77 Before '88 After '77 Before '88 After '77 Before '88	3. Vehicle with a GVW of 6000 10. or more</	

NOISE STANDARDS BY CATEGORY OF USE

Appendix C

NOTES STANDARDS BY CATEGORY OF USE

Appendix C

NOISE STANDARDS BY CATEGORY OF USE

PLANNING

The Basic Planning Standard is shown on the following page. The graph on page C-4 shows how to interpret the standard for various combinations of noise level and duration.

Noting that the $L_{eq}(24) = 55$ dB is based on speech interference criteria, the range from $L_{eq}(24) = 55$ to $L_{eq}(24) = 70$ might be acceptable if the community felt that adherence to the lower recommended level was an economic hardship or could not be produced with existing technology. The levels recommended here are what is desirable. For purposes of reference, the California Airport Noise Standards in 1970 recommended that the $L_{dn} = 65$ noise level in residential areas is the lowest economically practical level for airports.

ENFORCEMENT

The recommended enforcement standard is functionally equivalent to the planning standard, but is adjusted to accommodate the practical issues of enforcement.

The graph on page C-5 shows the interpretation of the Standard in a continuous curve. Unlike the Planning Standard, the Enforcement Standard does not have to consider the background noise in the computation of L_{eq} . Rather, the Enforcement Standard should be superimposed on the normal ambient conditions. The scale at the left is for cases where the ambient noise level does not exceed $L_{eq}(1) = 60$ dBA (or 70 dBA).

Appendix C

NOISE STANDARDS BY CATEGORY OF USE

PLANNING

The basic Planning Standard is shown on the following page. The graph on page C-4 shows how to interpret the standard for various combinations of noise level and duration. Noting that the $L_{eq}(1h) = 55$ dB is based on speech interference criteria, the range from $L_{eq}(1h) = 55$ to $L_{eq}(1h) = 50$ might be acceptable if the community felt that adherence to the lower recommended level was an economic hardship or could not be produced with existing technology. The levels recommended here are what is desirable. For purposes of reference, the California Airport Noise Standards in 1970 recommended that the $L_{dn} = 55$ noise level in residential areas is the lowest economically practical level for airports.

ENFORCEMENT

The recommended enforcement standard is functionally equivalent to the planning standard, but is adjusted to accommodate the practical issues of enforcement. The graph on page C-5 shows the interpretation of the standard in a continuous curve. Unlike the Planning Standard, the Enforcement Standard does not have to consider the background noise in the operation of L_{eq} . Rather, the Enforcement Standard should be superimposed on the normal ambient conditions. The scale at the left is for cases where the ambient noise level does not exceed $L_{eq}(1h) = 50$ dBA (or 70 dB).

	Measure	Indoor		To protect against both effects (b)	Outdoor		To protect against both effects (b)
		Activity Interference	Hearing Loss Consideration		Activity Interference	Hearing Loss Consideration	
Residential with outside space and Farm Residences	L_{dn} $L_{eq(24)}$	45	70	45	55	70	55
Residential with no outside Space	L_{dn} $L_{eq(24)}$	45	70	45			
Commercial	$L_{eq(24)}$	(a) 70		70(c)	(a) 70		70(c)
Inside Transportation	$L_{eq(24)}$ $L_{eq(24)}$	55	70	55			
Industrial	$L_{eq(24)}$ (d)	(a) 70		70(c)		70	70(c)
Hospitals	L_{dn} $L_{eq(24)}$	45	70	45	55	70	55
Educational	$L_{eq(24)}$ $L_{eq(24)}$ (d)	45	70	45	55	70	55
Recreational areas	$L_{eq(24)}$	(a) 70		70(c)	(a) 70		70(c)
Farm Land and General Unpopulated Land	$L_{eq(24)}$				(a) 70		70(c)

- Code: a. Since different types of activities appear to be associated with different levels, identification of a maximum level for activity interference may be difficult except in those circumstances where speech communication is a critical activity.
- b. Based on lowest level.
- c. Based only on hearing loss.
- d. An $L_{eq(8)}$ of 75 dB may be identified in these situations so long as the exposure over the remaining 16 hours per day is low enough to result in a negligible contribution to the 24-hour average, i.e., no greater than an L_{eq} of 60 dB.

Code: a. Since different types of activities appear to be associated with different levels, identification of a maximum level for activity interference may be difficult except in those circumstances where speech communication is a critical activity.

b. Based on lowest level.

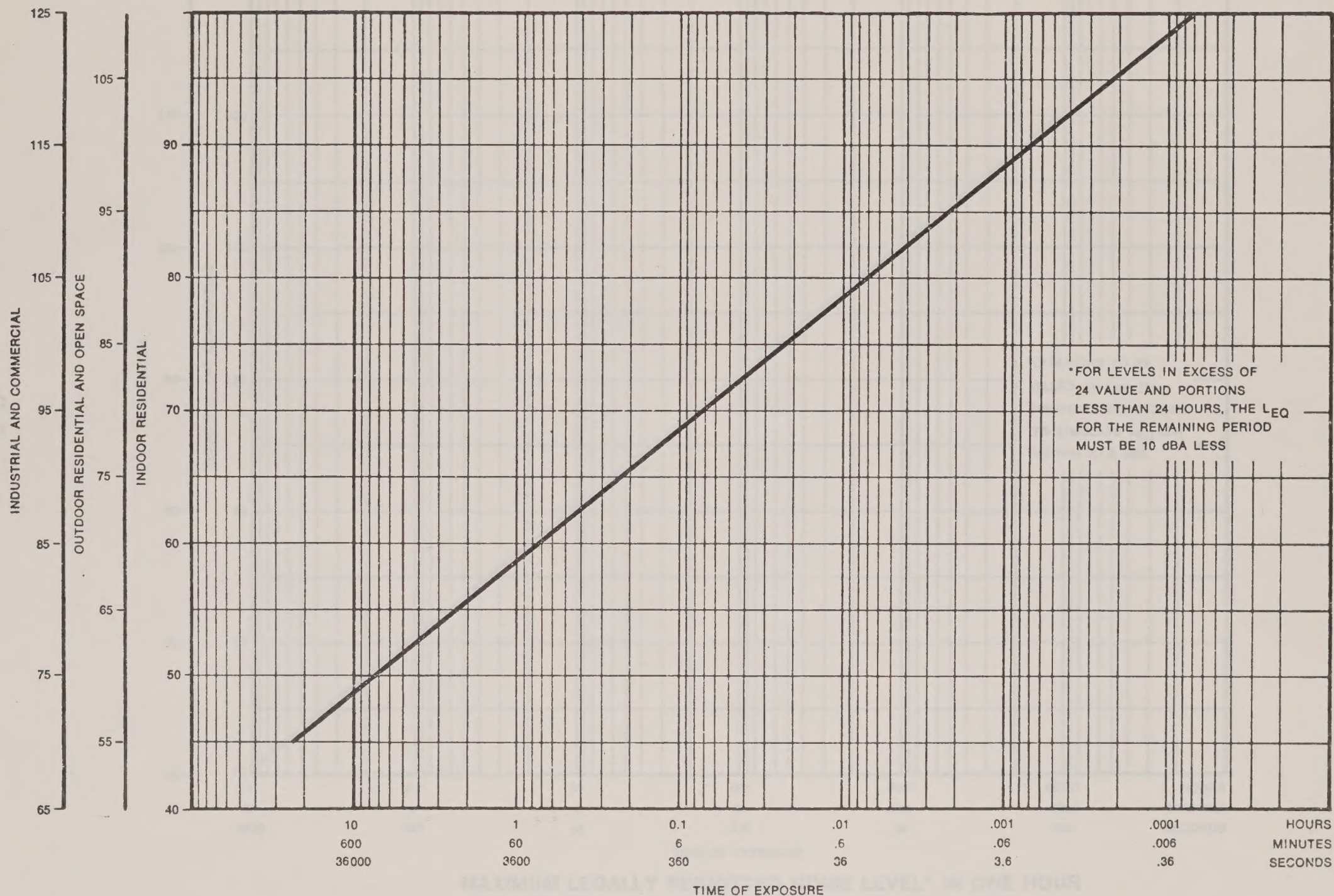
c. Based only on hearing loss.

d. An L_{eq}(5) of 75 dB may be identified in these situations as long as the exposure over the remaining hours per day is low enough to result in a negligible contribution to the 24-hour average, i.e., no greater than an L_{eq} of 65 dB.

Activity	Indoor		Outdoor	
	Speech	Other	Speech	Other
Unpopulated Land	L _{eq} (24)		(a) 70	70(e)
Farm Land and General				
Recreational areas	L _{eq} (24) (a) 70	L _{eq} (24) 70(c)	(a) 70	70(c)
Education	L _{eq} (24) 70	L _{eq} (24) 70	70	70
Hospitals	L _{eq} (24) 70	L _{eq} (24) 70	70	70
Industrial	L _{eq} (24) (a) 70	L _{eq} (24) 70(c)	70	70(c)
Inside Transport	L _{eq} (24) 70	L _{eq} (24) 70	70	70
Commercial	L _{eq} (24) (a) 70	L _{eq} (24) 70(c)	(e) 70	70(e)
Residential with no outside space	L _{eq} (24) 70	L _{eq} (24) 70		
Residential with out-side space and farm	L _{eq} (24) 70	L _{eq} (24) 70	70	70

C-4

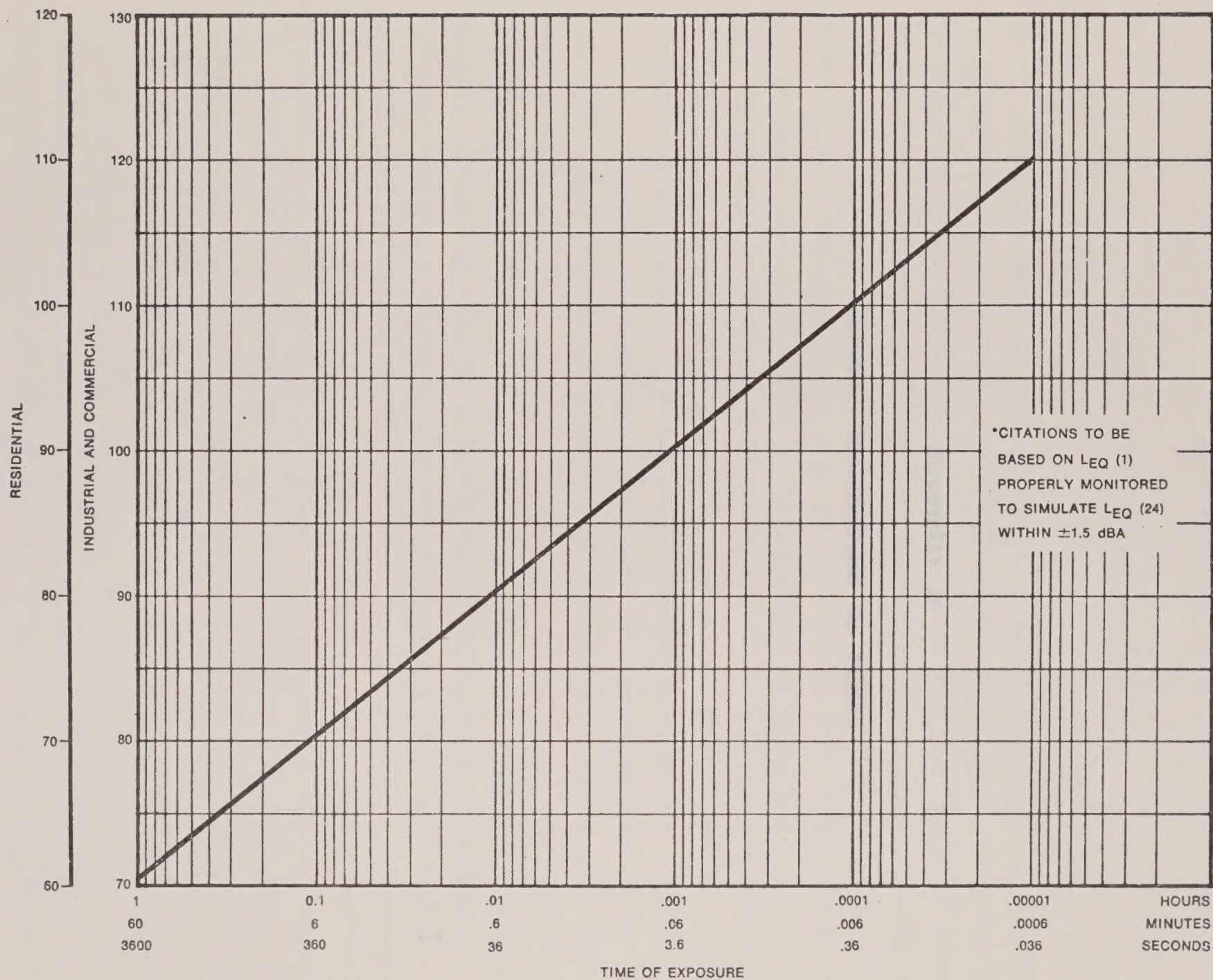
NOISE LEVEL —
A-WEIGHTED DECIBELS



MAXIMUM PERMITTED SOUND LEVELS FOR PLANNING*

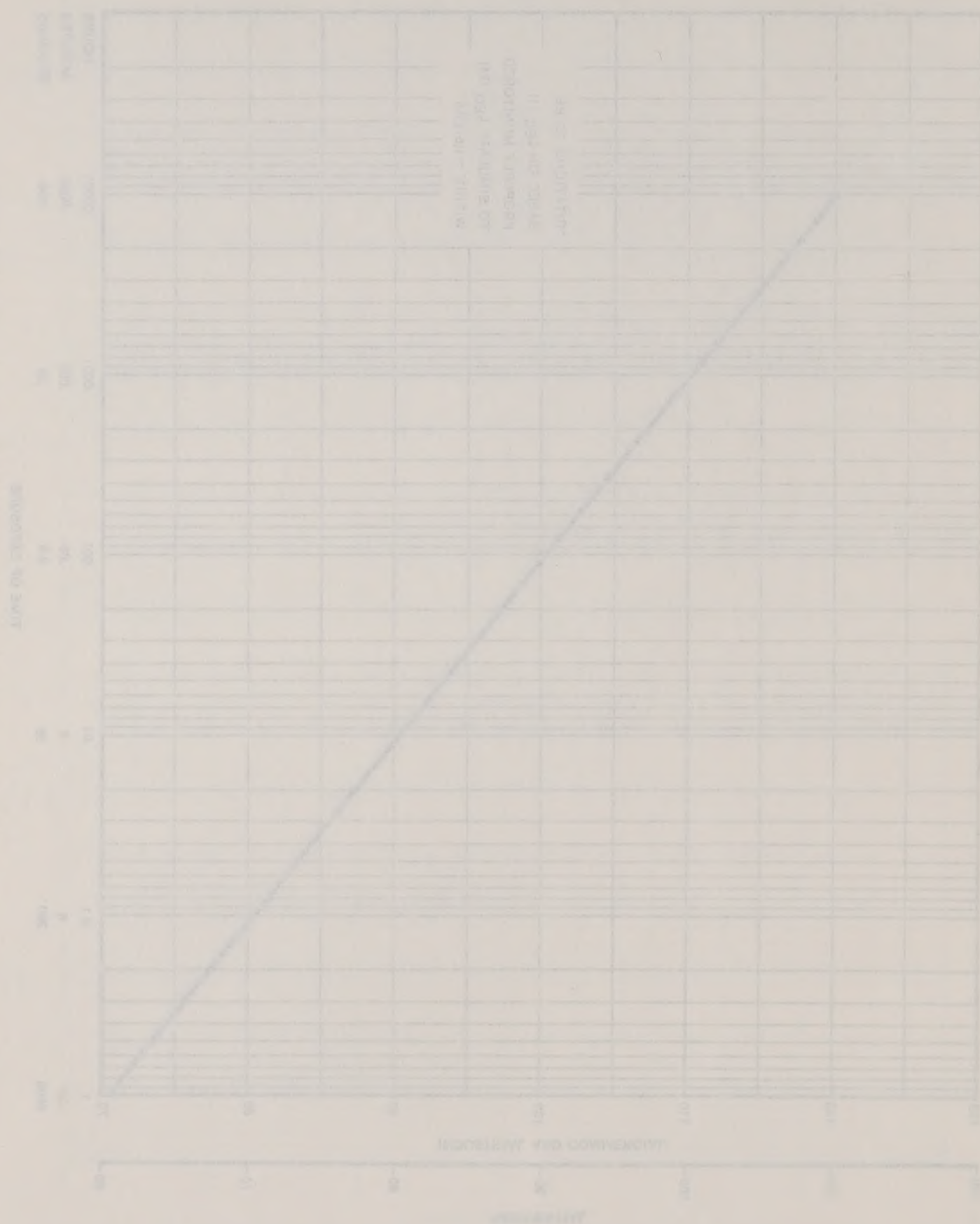


TO BE USED IN CONNECTION WITH THE
WAXHILL BAPTIST CHURCH TALENTS FOR
YOUNG PEOPLE



MAXIMUM LEGALLY PERMITTED NOISE LEVEL* IN ONE HOUR

MANUAL TESTING METHOD FOR NOISE TESTS IN ONE HOUR



GENERAL PROPERTIES OF SLEEP

Appendix D

GENERAL PROPERTIES OF SLIP

Appendix D

GENERAL PROPERTIES OF SLEEP

Examination of brain waves, other physiological measures, responsiveness, behavior, and the sequence of events during a night's sleep have led to the concept of sleep stages or states. There are recognizably different patterns that occur during a $\frac{1}{2}$ period of sleep. Since these patterns blend from one to another, there are several schemes for categorizing them into sleep stages or states. A popular set of categories is labelled I, II, III, IV, and I-REM. Another set of stages is defined in a slightly different manner. They are labelled A, B, C, D, and E. Some authors even combine the two sets of definitions.

Perhaps the easiest approach to these stages is to follow an idealized progression as one falls asleep. As one relaxes and enters a stage of drowsiness, the pattern of the electroencephalogram (EEG) changes from a jumble of rapid, irregular waves to the regular 9-12 hertz pattern known as the alpha rhythm. One is relaxed, but not asleep. Later, the alpha rhythm diminishes in amplitude and intermittently disappears. This is sleep stage A. As time progresses, the alpha rhythm is present less and less often until it disappears and is replaced by a low-voltage, fast, irregular pattern in the EEG; this is stage B. In the Roman numeral system, stage I corresponds to the late portions of stage A and all of stage B.

Next, there appear quick bursts of larger amplitude waves known as spindles or the spindles of sleep. Mixed with these spindles there will appear small-amplitude, low-frequency (1.5-3 hertz) waves known as delta waves. This stage is known as stage C or stage II. In the next stage of sleep, the spindles disappear and the delta waves become more regular and grow in amplitude. This is known as stage D. Later, the delta waves become even

Appendix B

GENERAL PROPERTIES OF SLEEP

Examination of brain waves, other physiological measures, responsiveness, behavior, and the sequence of events during a night's sleep have led to the concept of sleep stages or states. There are recognizably different patterns that occur during a period of sleep. Since these patterns blend from one to another, there are several schemes for categorizing them into sleep stages or states. A popular set of categories is labeled I, II, III, IV, and REM. Another set of stages is defined in a slightly different manner. They are labeled A, B, C, D, and E. Some authors even combine the two sets of definitions.

Perhaps the easiest approach to these stages is to follow an idealized progression as one falls asleep. As one relaxes and enters a stage of drowsiness, the pattern of the electroencephalogram (EEG) changes from a jumble of rapid, irregular waves to the regular 8-12 cycle pattern known as the alpha rhythm. One is relaxed, but not asleep. Later, the alpha rhythm diminishes in amplitude and intermittently disappears. This is sleep stage A. As time progresses, the alpha rhythm is present less and less often until it disappears and is replaced by a low-voltage, fast, irregular pattern in the EEG; this is stage B. In the Roman numeral system, stage I corresponds to the late portions of stage A and all of stage B.

Next, there appear quick bursts of larger amplitude waves known as spindles or the spindles of sleep. Mixed with these spindles there will appear small-amplitude, low-frequency (1.5-3 cycles) waves known as delta waves. This stage is known as stage II. In the next stage of sleep, the spindles disappear and the delta waves become more regular and grow in amplitude. This is known as stage D. Later, the delta waves become even

larger and of lower frequency (0.6-1 hertz). This is stage E. The Roman numeral system III and IV include stages D and E but the criterion for division is different. Stage E and E or III and IV are often referred to as deep or delta sleep.

The purpose is not to confuse the reader with two sets of sleep stages, but rather to communicate the idea that there is a progression of sleep stages. One can reasonably divide this progression by various criteria. Generally, in stage A or early I, man is drowsy, but awake. In stage B, or late I, one drifts or "floats" back and forth between waking and sleeping. When awakened at this stage of sleep, one is not quite sure whether he has been asleep. Stages C, D, and E or II, III, and IV represent definite sleep.

The remaining stage, which has been of great interest, is the so-called Rapid Eye Movement (REM) stage of sleep. In REM sleep, the sleeper exhibits characteristics of stage I (late A and B). There are: fast, low-voltage brain waves; other evidence of variable but definite physiological activation; and rapid eye movements. Consequently, this stage is usually tagged I-REM. While dreaming and mental activity can take place in all sleep stages it is during I-REM that most dreams occur.

larger and of lower frequency (0.6-1 hertz). This is stage E. The human cerebral system III and IV include stages D and E but the criterion for division is different. Stage E and F or III and IV are often referred to as deep or delta sleep.

The purpose is not to confuse the reader with two sets of sleep stages, but rather to communicate the idea that there is a progression of sleep stages. One can reasonably divide this progression by various criteria. Generally, in stage A or early I, man is drowsy, but awake. In stage B, or late I, one drifts or "floats" back and forth between waking and sleeping. When awakened at this stage of sleep, one is not quite sure whether he has been asleep. Stages C, D, and E or II, III, and IV represent definite sleep.

The remaining stage, which has been of great interest, is the so-called Rapid Eye Movement (REM) stage of sleep. In REM sleep, the sleeper exhibits characteristics of stage I (late A and B). There are: fast, low-voltage brain waves; other evidence of variable but definite physical activation; and rapid eye movements. Consequently, this stage is usually tagged I-REM. While dreaming and mental activity can take place in all sleep stages it is during I-REM that most dreams occur.

Appendix E

GLOSSARY

Appendix E

Glossary

Appendix E

GLOSSARY

1. A-Weighted Sound Level (dBA) — a unit of sound measurement in which a single number represents the human ear's response to sound. This is accomplished by a weighting network, signified as "A", assigned to the appropriate frequency bands and thereby reducing the effects of the low and high frequencies with respect to the medium frequencies. Sound level meters with an A-weighted scale are used for community noise measurement with units being expressed as dBA.
2. Ambient Noise — The total level of all noise near and far, in a given system or environment, independent of the specific source being measured.
3. Audible Range of Frequency — The normal frequency range of human hearing encompassing 16 Hz to 20,000 Hz.
4. Community Noise Equivalent Level (CNEL) — A cumulative measure of community noise exposure for a 24-hour day, using the A-weighting sound level and expressed in logarithmic units. This CNEL scale takes into account the single event sound level, single event duration, single event occurrence frequency, and the time of the occurrence of the noise source. It additionally, applies weighting factors which place greater significance on noise events occurring in the nighttime (10 p.m. to 7 a.m.) than during the evening (7 p.m. to 10 p.m.) or daytime (7 a.m. to 7 p.m.) respectively. It is used for for evaluating noise impact on an area.

Appendix B

GLOSSARY

1. A-Weighted Sound Level (dBA) - a unit of sound measurement in which a single number represents the human ear's response to sound. This is accomplished by a weighting network, designated as "A", assigned to the appropriate frequency bands and thereby reducing the effects of the low and high frequencies with respect to the median frequencies. Sound level meters with an A-weighted scale are used for community noise measurement with units being expressed as dBA.
2. Ambient Noise - The total level of all noise near and far in a given system or environment, independent of the specific source being measured.
3. Audible Range of Frequency - The normal frequency range of human hearing encompassing 16 Hz to 20,000 Hz.
4. Community Noise Equivalent Level (CNEL) - A cumulative measure of community noise exposure for a 24-hour day, using the A-weighting sound level and expressed in logarithmic units. This CNEL scale takes into account the single event sound level, single event duration, single event occurrence frequency, and the time of the occurrence of the noise source. It additionally, applies weighting factors which place greater significance on noise events occurring in the nighttime (10 p.m. to 7 a.m.) than during the evening (7 p.m. to 10 p.m.) or daytime (7 a.m. to 7 p.m.) respectively. It is used for evaluating noise impact on an area.

5. Composite Noise Rating (CNR) - A 24-hour cumulative noise exposure method used for evaluating noise impact around airport facilities. It is primarily utilized by the Department of Defense in predicting noise environments around military airfields. Similar, mathematically to CNEL but without single event duration correction no accountability for evening weighting, and a difficult nighttime weighting.
6. Day-Night Average Sound Level (L_{dn}) - A 24-hour A-weighted cumulative noise exposure method similar to CNEL but only applies a time of day weighting to the nighttime period (10 p.m. to 7 a.m.).
7. Equivalent Sound Level (L_{eq}) - The level of a constant sound, which over a given time interval and situation which has the same sound energy as a time-varying sound. Usually related to period of time over which average is taken.
8. Frequency - The number of times per second in which a sine wave is repeated, expressed in a measurement unit called Hertz (Hz).
9. Mode Noise Level - The most frequently occurring noise level in any specified time interval.
10. Noise - Annoying, harmful or unwanted sound.
11. Noise Attenuation - The ability of a medium to reduce the level of a noise source, specified in decibels (dB) of transmission loss usually in octave frequency bands.
12. Noise Contour - A line connecting points of equal noise level as measured on the same scale.

5. Composite Noise Rating (CNR) - A 24-hour cumulative noise exposure method used for evaluating noise impact around airport facilities. It is primarily utilized by the Department of Defense in predicting noise environments around military airfields. Similar, mathematically to CNEL but without single event duration correction or accountabilities for evening weighting, and a different nighttime weighting.
6. Day-Night Average Sound Level (L_{dn}) - A 24-hour A-weighted cumulative noise exposure method similar to CNEL but only applies a time of day weighting to the nighttime period (10 p.m. to 7 a.m.).
7. Equivalent Sound Level (L_{eq}) - The level of a constant sound which over a given time interval and duration which has the same sound energy as a time-varying sound. Usually related to period of time over which average is taken.
8. Frequency - The number of times per second in which a sine wave is repeated, expressed in a measurement unit called Hertz (Hz).
9. Mode Noise Level - The most frequently occurring noise level in any specified time interval.
10. Noise - Annoying, harmful or unwanted sound.
11. Noise Attenuation - The ability of a medium to reduce the level of a noise source, specified in decibels (dB) of transmission loss usually in octave frequency bands.
12. Noise Contour - A line connecting points of equal noise level as measured on the same scale.

13. Noise Exposure Forecast (NEF) — A 24-hour cumulative noise exposure method similar to CNR but with corrections for single event duration and pure tone components in sound source spectrum. Used almost exclusively for characterizing community impact to aircraft noise.
14. Noise Exposure Index (NEI) — The general mathematical form for L_{eq} , CNEL, CNR, NEF, and L_{dn} .
15. Noise Impacted Area — A specific area exposed to substantial levels of noise, usually described by a cumulative exposure rating scale.
16. Noise Performance Standards — A standard based on permitted emissions rather than on the category or type of land use.
17. Noise Sensitive Land Uses — Noise sensitive land used include but are not limited to: residential hospitals, schools, libraries, churches, unsoundproofed offices, hotels and motels and outdoor recreational areas. The use of land in which individuals are or can be particularly affected by noise is determined by such factors as psychological impairment, sleep disturbance, speech and talk interference and annoyance.
18. Maximum Noise Level — The maximum instantaneous level that occurs during a specified time interval. In acoustics, maximum sound pressure is to be understood for single events unless some other kind of level is specified.
19. Sound — As used herein, a reaction in the ear caused by mechanical radiant energy of a source transmitted by longitudinal pressure waves in air or other elastic medium.

13. Noise Exposure Forecast (NEF) - A 24-hour cumulative noise exposure method similar to CNR but with corrections for single event duration and pure tone components in sound source spectrum. Used almost exclusively for characterizing community impact to aircraft noise.
14. Noise Exposure Index (NEI) - The general mathematical form for L_{eq} , $CNEL$, CNR , NEL , and L_{dn} .
15. Noise Impacted Area - A specific area exposed to substantial levels of noise, usually described by a cumulative exposure rating scale.
16. Noise Performance Standards - A standard based on permitted extensions rather than on the category or type of land use.
17. Noise Sensitive Land Uses - Noise sensitive land uses include but are not limited to: residential hospitals, schools, libraries, churches, unincorporated offices, hotels and motels and outdoor recreational areas. The use of land in which individuals are or can be particularly affected by noise is determined by such factors as psychological impairment, sleep disturbance, speech and talk interference and annoyance.
18. Maximum Noise Level - The maximum instantaneous level that occurs during a specified time interval. In statistics, maximum sound pressure is to be understood for single events unless some other kind of level is specified.
19. Sound - As used herein, a reaction in the ear caused by mechanical radiant energy of a source transmitted by longitudinal pressure waves in air or other elastic medium.

20. Sound Level Meter — A measurement instrument, containing a microphone, an amplifier, an output meter, and one or more frequency weighting networks which is used for the determination of noise and sound levels.

Appendix F

FIELD SURVEY DATA

Community Noise Survey

30. Sound Level Meter -- A measurement instrument, containing a microphone, an amplifier, an output meter, and one or more frequency weighting networks which is used for the determination of noise and sound levels.

Appendix F

FIELD SURVEY DATA Community Noise Survey

Appendix F

FIELD SURVEY DATA

Community Noise Survey

Typically when a noise impact is due to noise sources from transportation activities, the amount of annoyance attributed to the noise source is a function of the noise source itself, the time of day, the location in the community where the noise occurs, and the sensitivity of the noise receiver. Thus, the existing noise impact must be assessed to select appropriate standards, criteria, and noise ordinances. The identification of noise sources is necessary to protect public health and to ensure that areas of high noise impact do not become areas of low noise impact.

To establish the existing noise levels and identify the noise sources present in Burbank, a community noise survey was conducted by Olson Associates in the City from May 22 through May 24, 1974. Acoustic measurements utilizing the A-weighted scale were made at 32 community locations during each of the three 24-hour periods, 7:00 a.m. to 7:00 p.m., 7:00 p.m. to 10:00 p.m., and 10:00 p.m. to 7:00 a.m. Included in the 32 sites were busy city intersections and freeways, city parks, typical residential, commercial, and industrial areas, hospitals, city school campuses, and remote hillside settings. The selection of 32 sites in these representative areas provides community-wide coverage of the noise sources present. At the least, the survey was designed to identify the noise sources and to provide a baseline of noise levels in the City. Specific noise sources (i.e., power cars, trucks, buses, motorcycles, etc.) were identified as far as possible and noted as to their location and direction of travel. The survey was designed to provide a baseline of noise levels in the City.

Appendix F

FIELD SURVEY DATA
Community Noise Survey

Appendix F

FIELD SURVEY DATA

Community Noise Survey

Typically urban environmental noise impact is due to noise emissions from transportation related activities. The amount of annoyance attributed to a noise event is a function of the noise source itself, the time of day of the occurrence, the location in the community where the event occurs, and the sensitivity of the noise receiver. Thus, the existing noise impact must be assessed to select appropriate standards, criteria, and noise ordinances that identify where remedial action is necessary to protect public health and well-being in high noise impact areas of the community and to ensure that currently existing low impact areas do not become adversely noise impacted in the future.

To establish the existing baseline noise levels and identify the noise sources present in Burbank, a community noise survey was conducted by Olson engineers in the City from May 22 through May 23, 1974. Acoustic measurements utilizing the A-weighted scale were made at 32 community locations during each of the three CNEL time periods, 7:00 a.m. to 7:00 p.m.; 7:00 p.m. to 10:00 p.m.; 10:00 p.m. to 7:00 a.m. Included in the 32 sites were busy city intersections and freeways, city parks, typical residential, commercial, and industrial areas, hospitals, city school campuses, and remote hillside settings. The selection of 32 sites in these representative areas provides community-wide coverage of the noise sources present. Each of the sites was monitored for a minimum of 10 minutes. Specific noise sources (i.e., passenger cars, trucks, buses, motorcycles, sports cars, and aircraft) were noted as observed and both the maximum and the median dBA values for each event were recorded at

Appendix F

FIELD SURVEY DATA Community Noise Survey

Typically urban environmental noise impact is due to noise emissions from transportation related activities. The amount of annoyance attributed to a noise event is a function of the noise source itself, the time of day of the occurrence, the location in the community where the event occurs, and the sensitivity of the noise receiver. Thus, the existing noise impact must be assessed to select appropriate standards, criteria, and noise ordinances that identify where remedial action is necessary to protect public health and well-being in high noise impact areas of the community and to ensure that currently existing low impact areas do not become adversely noise impacted in the future.

To establish the existing baseline noise levels and identify the noise sources present in Burbank, a community noise survey was conducted by Olson engineers in the City from May 22 through May 24, 1974. Acoustic measurements utilizing the A-weighted scale were made at 32 community locations during each of the three (24-hour) periods, 7:00 a.m. to 7:00 p.m.; 7:00 p.m. to 10:00 p.m.; 10:00 p.m. to 7:00 a.m. Included in the 32 sites were busy city intersection and freeways, city parks, typical residential, commercial, and industrial areas, hospitals, city school campuses, and remote hillside settings. The selection of 32 sites in these representative areas provides community-wide coverage of the noise sources present. The of the sites was monitored for a minimum of 10 minutes. Specific noise sources (i.e., passenger cars, trucks, buses, motorcycles, sports cars, and aircraft) were noted as observed and both the maximum and the median dBA values for each event were recorded at

each site. In addition, the residual (background) noise level was monitored at each site.

A history of strong legal action and public concern exists in Burbank over aircraft operations from Hollywood-Burbank Airport (Lockheed Air Terminal). Measurements of aircraft noise from this facility were made by Olson engineers on October 26 and October 31, 1972. In this measurement effort, a total of 249 acoustic measurements were made of aircraft noise. These measurements were made at 13 separate locations in the vicinity of the flight tracks associated with the air terminal. Because operational techniques, aircraft fleet mix, and runway utilization have not changed significantly since October, 1972, this acoustic data can be considered representative and useful.

Results of the community measurement survey are presented on the survey location summary sheets.

each side. In addition, the terminal (background) noise level was monitored at each side.

A history of strong legal action and public concern exists in Burbank over aircraft operations from Hollywood-Burbank Airport (Lockheed Air Terminal). Measurements of aircraft noise from this facility were made by Olson engineers on October 28 and October 31, 1972. In this measurement effort, a total of 149 acoustic measurements were made of aircraft noise. These measurements were made at 13 separate locations in the vicinity of the flight tracks associated with the air terminal. Because operational techniques, aircraft fleet mix, and runway utilization have not changed significantly since October, 1972, this acoustic data can be considered representative and useful.

Results of the community measurement survey are presented on the survey location summary sheets.

Table 10-1

HOLLYWOOD-BURBANK MEASUREMENT DATA

<u>Location No.</u>	<u>Readings</u>
1	70.2
2	70.8
3	64.0
5	65.0
6	56.0
7	57.0
8	52.0
9	70.0
10	70.5
11	60.0
12	62.0
13	65.0
14	66.4

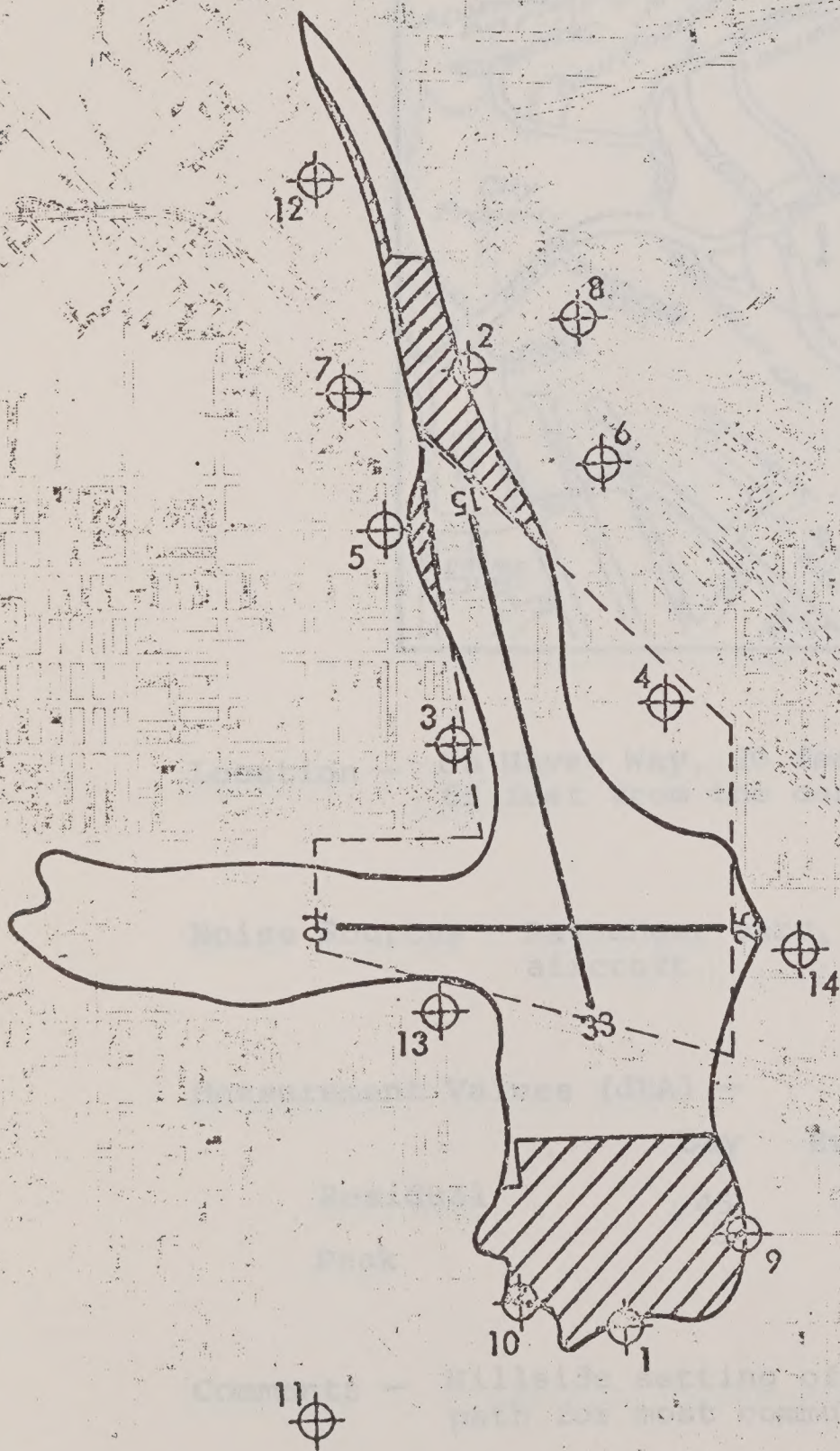
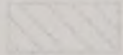
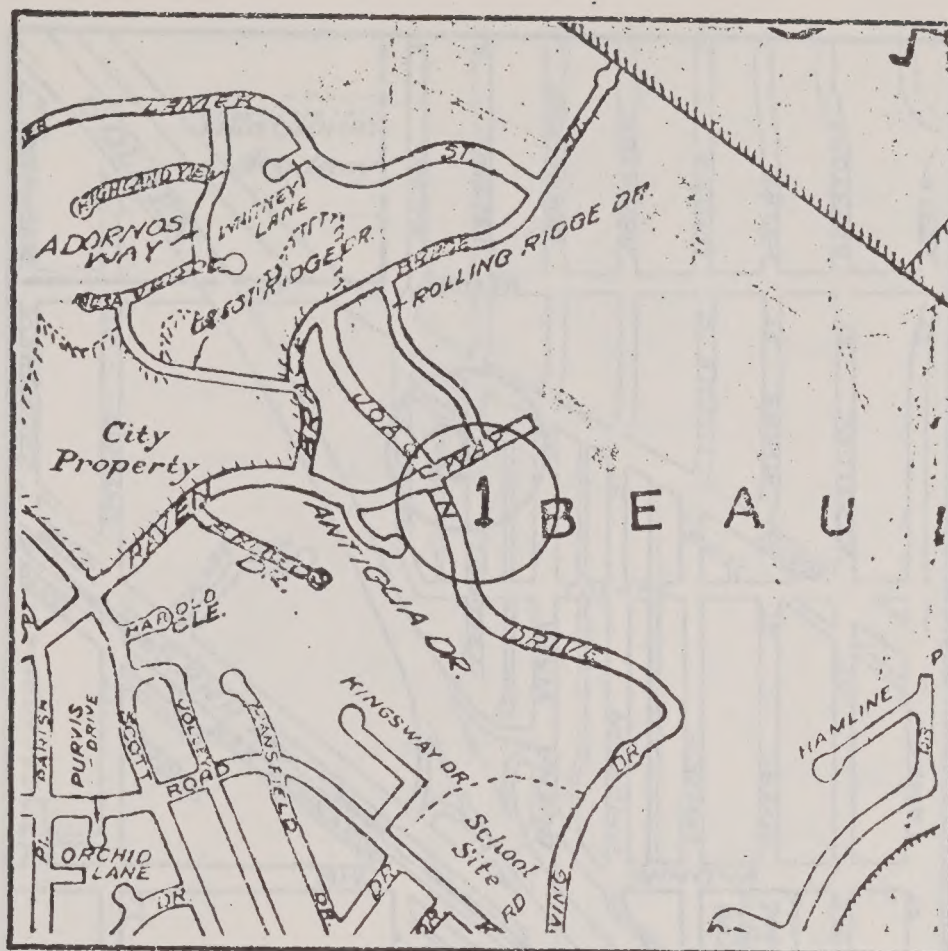


PLATE 10-1	
HOLLYWOOD-BURBANK AIRPORT	
1972 70 CNEL CONTOUR	
---	PROPERTY LINE
⊕	MEASUREMENT POINTS
	INCOMPATIBLE LAND USE
NORTHROP	
0 1 SCALE 100'	

SCALE 1" = 100'	NORTH
0 1 2	
INCOMPATIBLE LAND USE	
MEASUREMENT POINTS	
PROPERTY LINE	---
1973 TO 1982 CONTOUR	---
HOLLYWOOD-BURBANK AIRPORT	
PLATE 10-1	



Site Number - 1



Location - On Haven Way, 20 feet from centerline and 65 feet from the centerline of Joaquin Drive.

Noise Sources - Passenger cars, sports cars and light trucks, aircraft.

Measurement Values (dBA) -

	Day	Evening	Night
Residual	45	44	44
Peak	-	-	-

Comments - Hillside setting offers line of site and propagation path for most community noise sources.



Location - On Haven Way, 20 feet from centerline and 65 feet from the centerline of Joplin Drive.

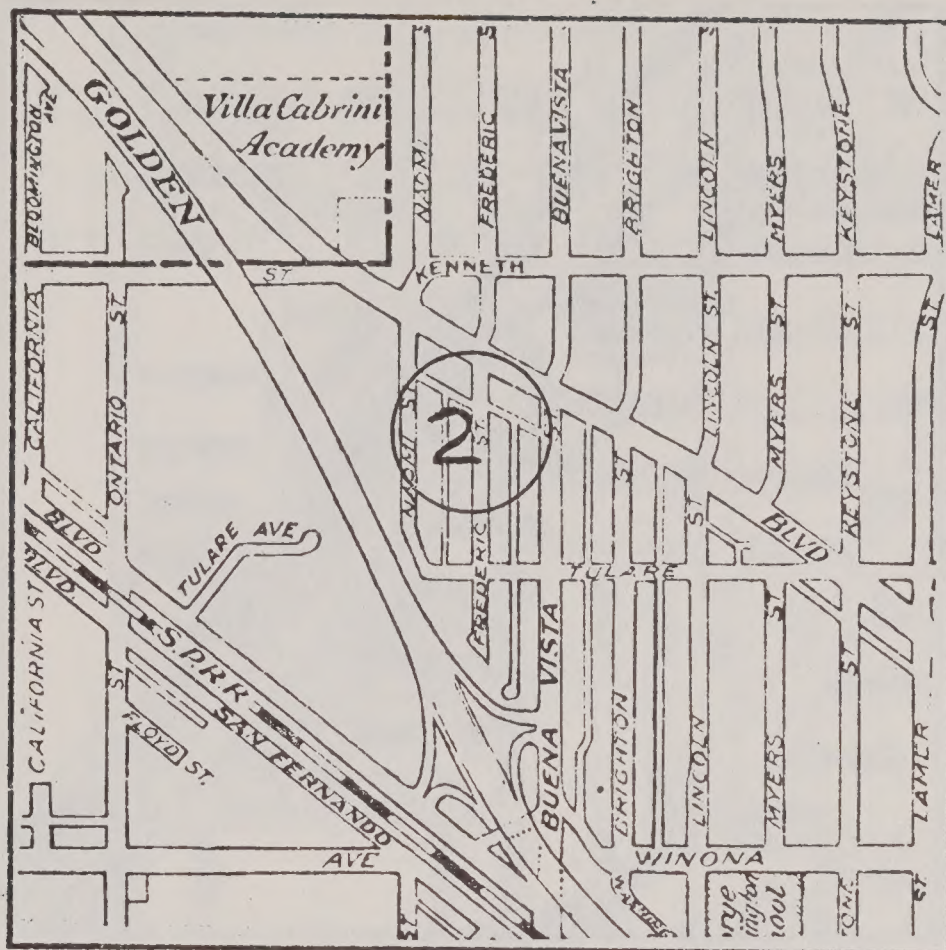
Noise Sources - Passenger cars, sports cars and light trucks, aircraft.

Measurement Values (dBA) -

Residual	Day	Evening	Night
Peak	45	44	44

Comments - Noise barrier setting along line of site and propagation path for most community noise sources.

Site Number - 2



Location - On Fedric, 20 feet from the centerline at 2,809 Federic.

Noise Sources - Passenger cars, sports cars and light trucks, freeway trucks and buses, aircraft.

Measurement Values (dBA) -

	Day	Evening	Night
Residual	53	51	49
Peak	-	-	-

Comments - Residual noise level is limited by freeway.



Location - On Federal, 50 feet from the centerline at 2,600
Federal.

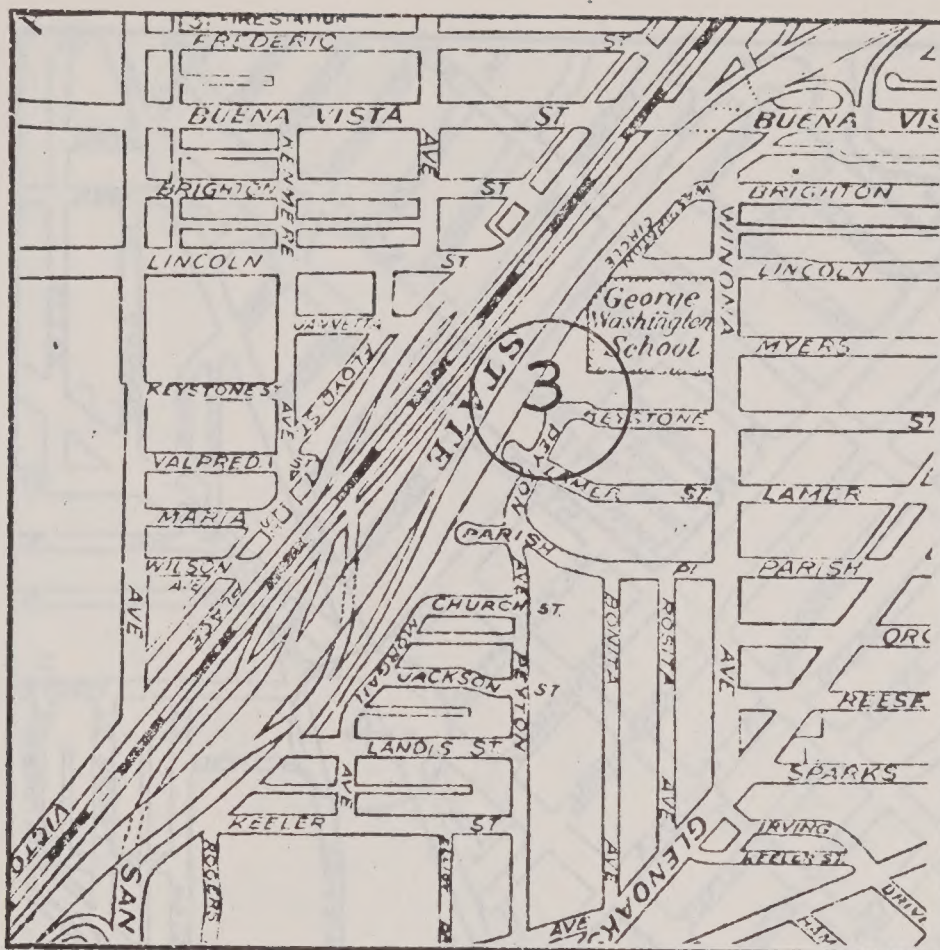
Noise Sources - Passenger cars, sports cars and light trucks,
freeway trucks and buses, aircraft.

Measurement Values (dBA) -

Day	Evening	Night
53	51	49
Peak		

Comments - Residual noise level is limited by freeway.

Site Number - 3



Location - 65 feet from the centerline of Keystone at 2,316 Keystone Street.

Noise Sources - Passenger cars, freeway trucks and buses.

Measurement Values (dBA) -

	Day	Evening	Night
Residual	67	66	65
Peak	-	-	-

Comments - Residual noise level limited by freeway.



Location - 65 feet from the centerline of Keystone at 2.316
Keystone Street.

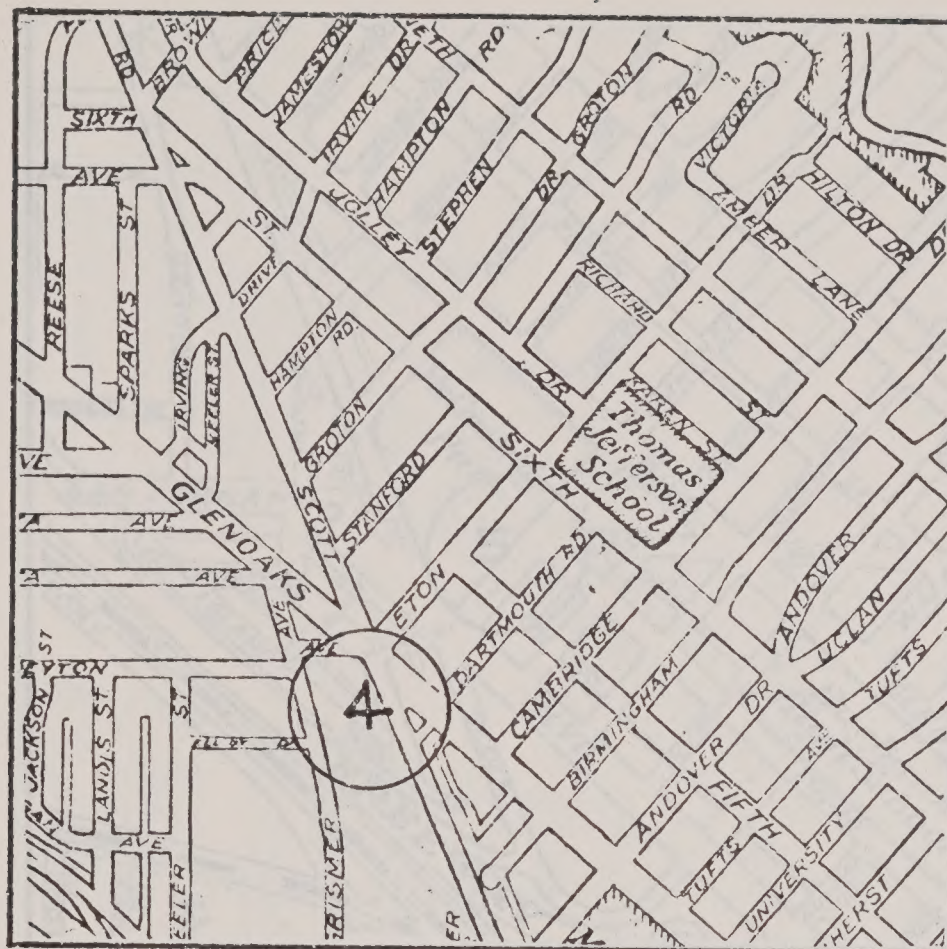
Noise Sources - Passenger cars, freeway trucks and buses.

Measurement values (dBA) -

Residual	Day	Evening	Night
Peak	67	66	65

Comments - Residual noise level limited by freeway.

Site Number - 4



Location - On Scott, 20 feet from the centerline and 65 feet from the centerline of Glenoaks.

Noise Sources - Passenger cars, sports cars and light trucks.

Measurement Values (dBA) -

	Day	Evening	Night
Residual	53	52	46
Peak	-	-	-

Comments - Residual noise level limited by transportation noise sources.



Location - On Scott, 20 feet from the centerline and 65 feet from the centerline of Glenhurst.

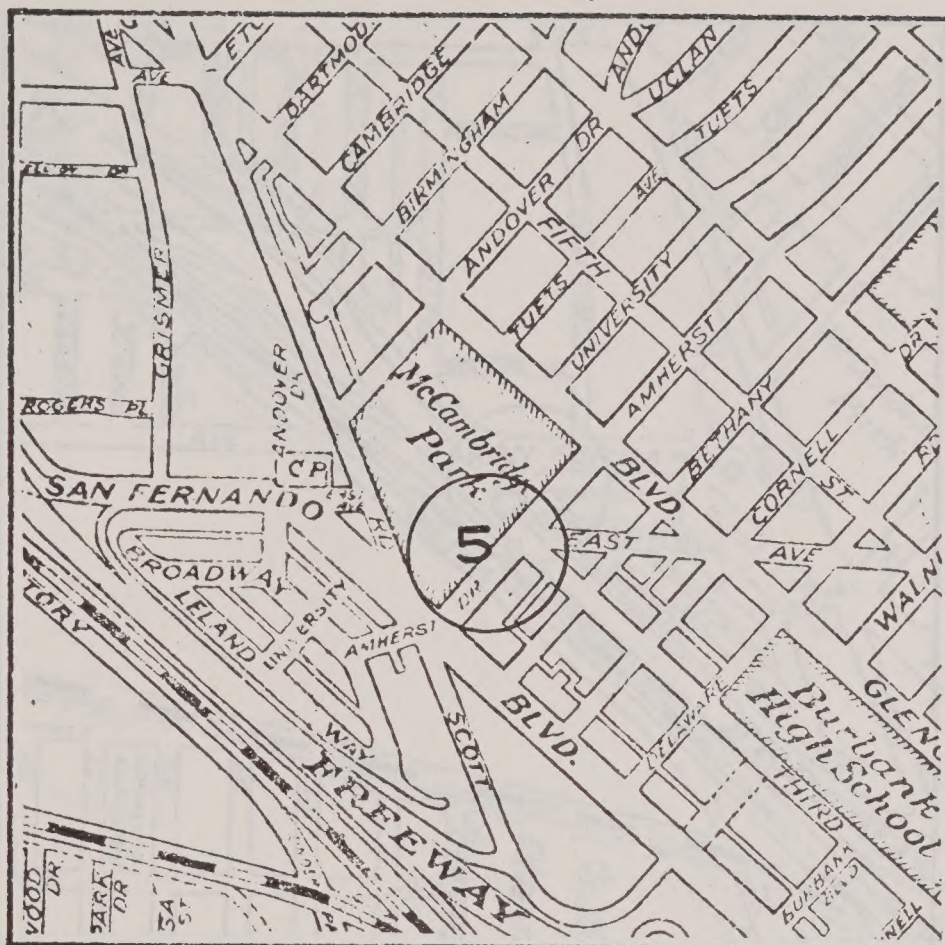
Noise Sources - Passenger cars, sports cars and light trucks.

Measurement Values (dBA) -

Residual	Day	Evening	Night
Peak	53	52	46

Comments - Residual noise level limited by transportation noise sources.

Site Number - 5



Location - 65 feet from the centerline of Amnhearst Drive in McCambridge Park.

Noise Sources - Passenger cars, sports cars and light trucks, trucks and buses.

Measurement Values (dBA) -

	Day	Evening	Night
Residual	54	53	52
Peak	-	-	-

Comments - Residual noise level set by G.S. freeway and San Fernando traffic.



Location - 65 feet from the centerline of Amherst Drive
in Cambridge Park.

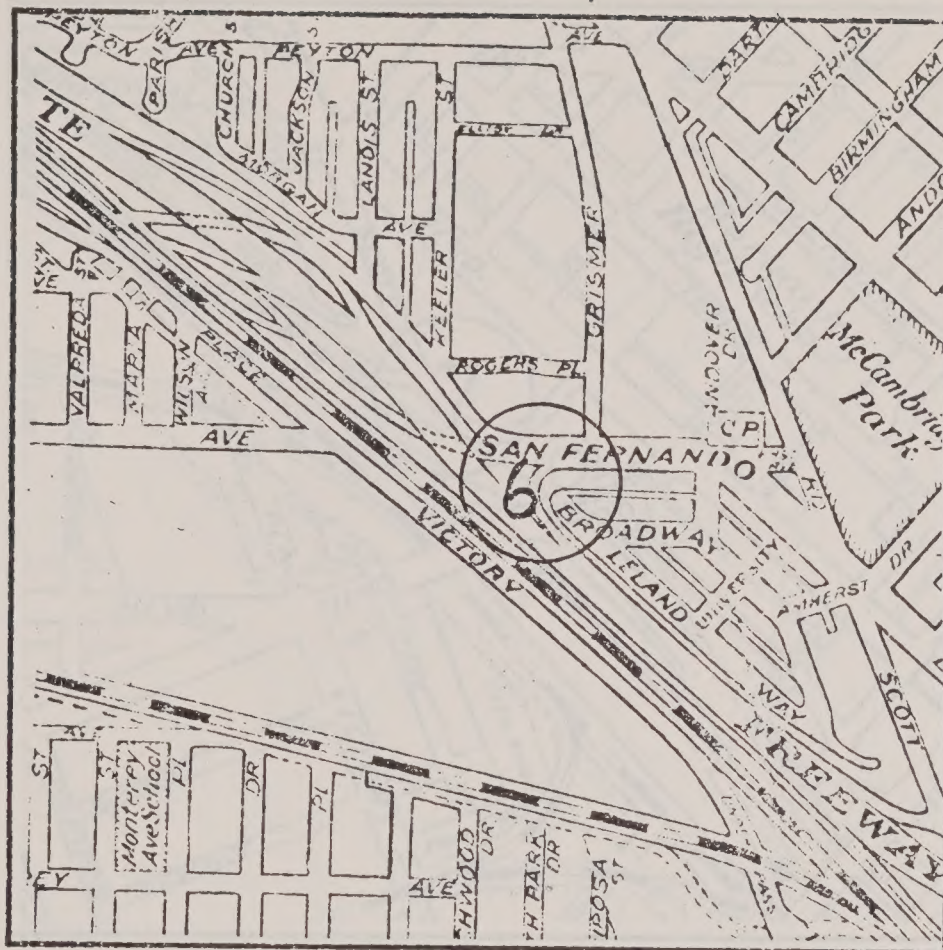
Noise Sources - Passenger cars, sports cars and light trucks,
trucks and buses.

Measurement Values (dBA) -

Residential	Day	Evening	Night
Peak	54	53	52

Comments - Residential noise level set by G.S. freeway and San
Bernardo traffic.

Site Number - 6



Location - At intersection of Leland and Broadway 150 feet from median of Golden State Freeway.

Noise Sources - Passenger cars, freeway trucks and buses.

Measurement Values (dBA) -

	Day	Evening	Night
Residual	67	70	65
Peak	-	-	-

Comments - Residual noise level is set by G.S. freeway.



Location - At intersection of Ireland and Broadway 150 feet from median of Golden State Freeway.

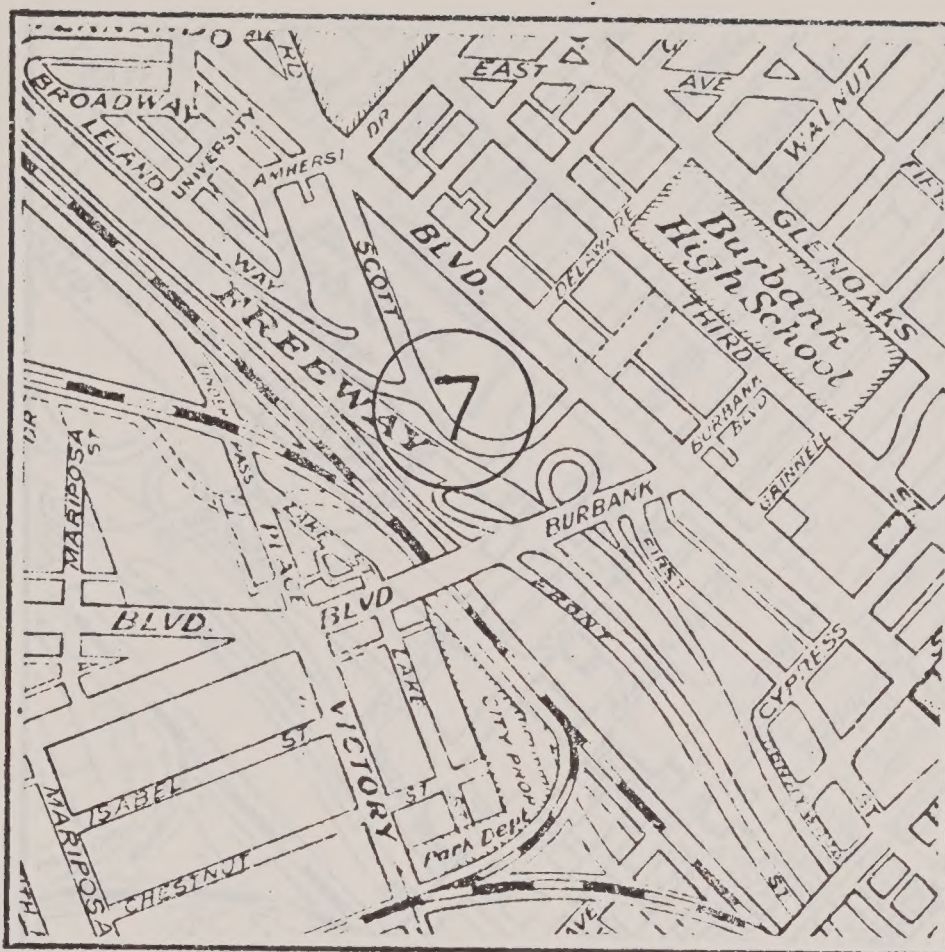
Noise Sources - Passenger cars, freeway trucks and buses.

Measurement Values (dBA) -

Day	Evening	Night
67	70	63
Peak		

Comments - Peak noise level is set by G.S. freeway.

Site Number - 7



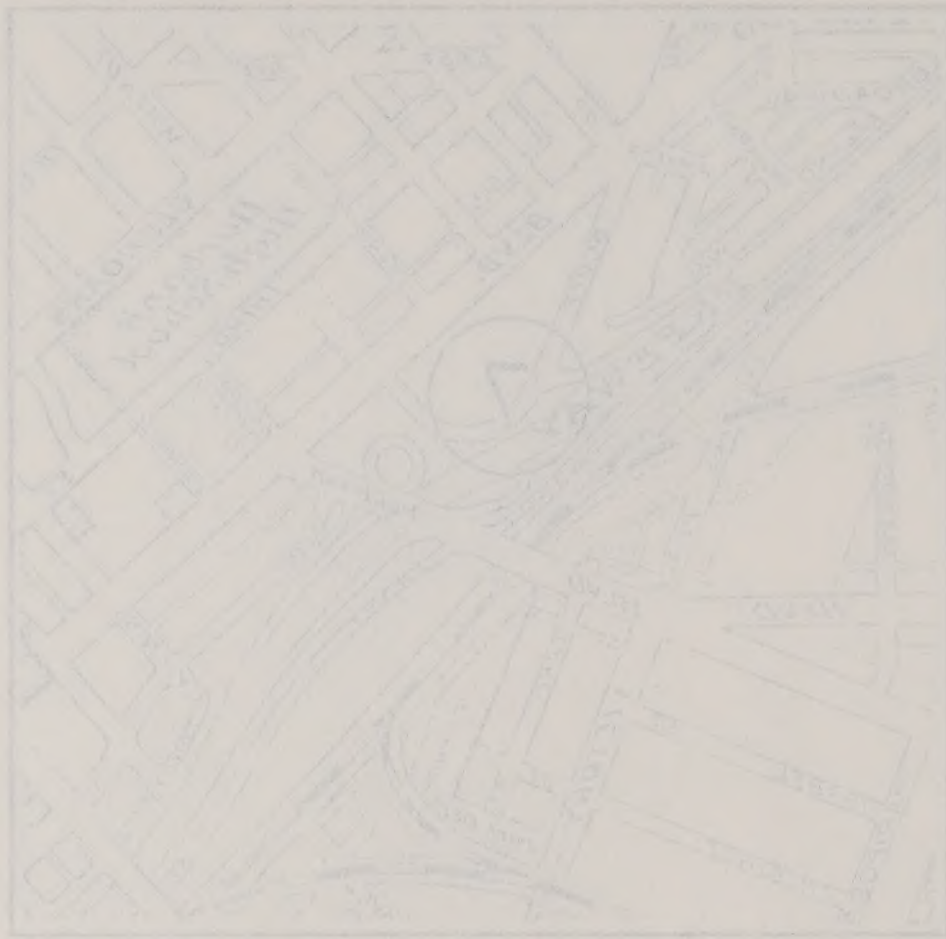
Location - On Scott, 150 feet from median of Golden State freeway.

Noise Sources - Freeway trucks and buses

Measurement Values (dBA) -

	Day	Evening	Night
Residual	69	73	65
Peak	-	-	-

Comments - Residual noise level is set by G.S. freeway.



Location - On Scott, 150 feet from median of Golden State freeway.

Noise Sources - Freeway trucks and buses.

Measurement Values (dBA) -			
Residential	Day	Evening	Night
Peak	65	73	65

Comments - Residential noise level is set by S.E. freeway.

Site Number -- 8



Location -- On Burbank Boulevard, 20 feet from the centerline and 150 feet from the centerline of San Fernando.

Noise Sources -- Passenger cars, trucks and buses, aircraft.

Measurement Values (dBA) --

	Day	Evening	Night
Residual	59	59	58
Peak	-	-	-

Comments -- Modified exhaust or Burbank high school pupils cars is very intrusive.



Location - On Burbank Boulevard, 20 feet from the center-line and 150 feet from the centerline of San Fernando.

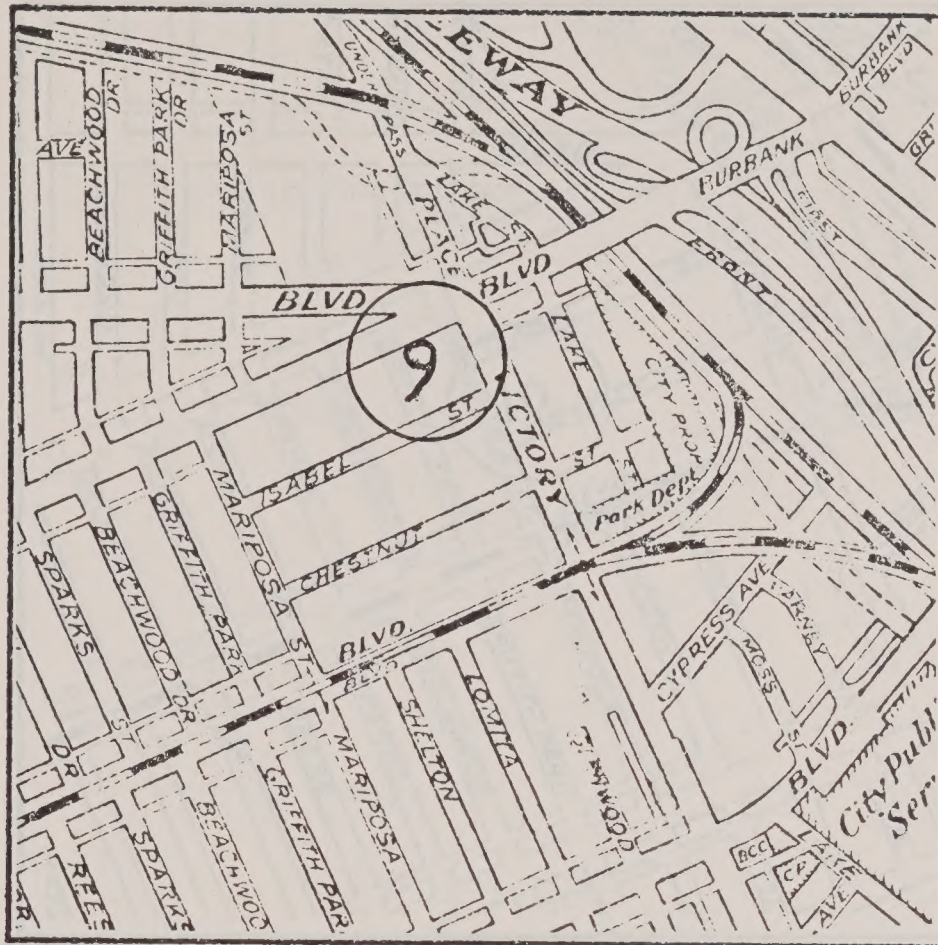
Noise Sources - Passenger cars, trucks and buses, aircraft.

Measurement Value (dBA) -

Residual	Day	Evening	Night
Peak	55	55	55

Comments - Modified exhaust of Burbank high school pupils cars is very intrusive.

Site Number - 9



Location — On Victory Boulevard, 25 feet from the centerline and 65 feet from the centerline of Victory Place.

Noise Sources — Passenger cars, sports cars and light trucks, motorcycles, trucks and buses aircraft.

Measurement Values (dBA) —

	Day	Evening	Night
Residual	64	62	60
Peak	-	-	-

Comments — Residual noise level set by Burbank Boulevard, Victory Boulevard, and Victory Place traffic.



Location - On Victory Boulevard, 25 feet from the centerline and 65 feet from the centerline of Victory Place.

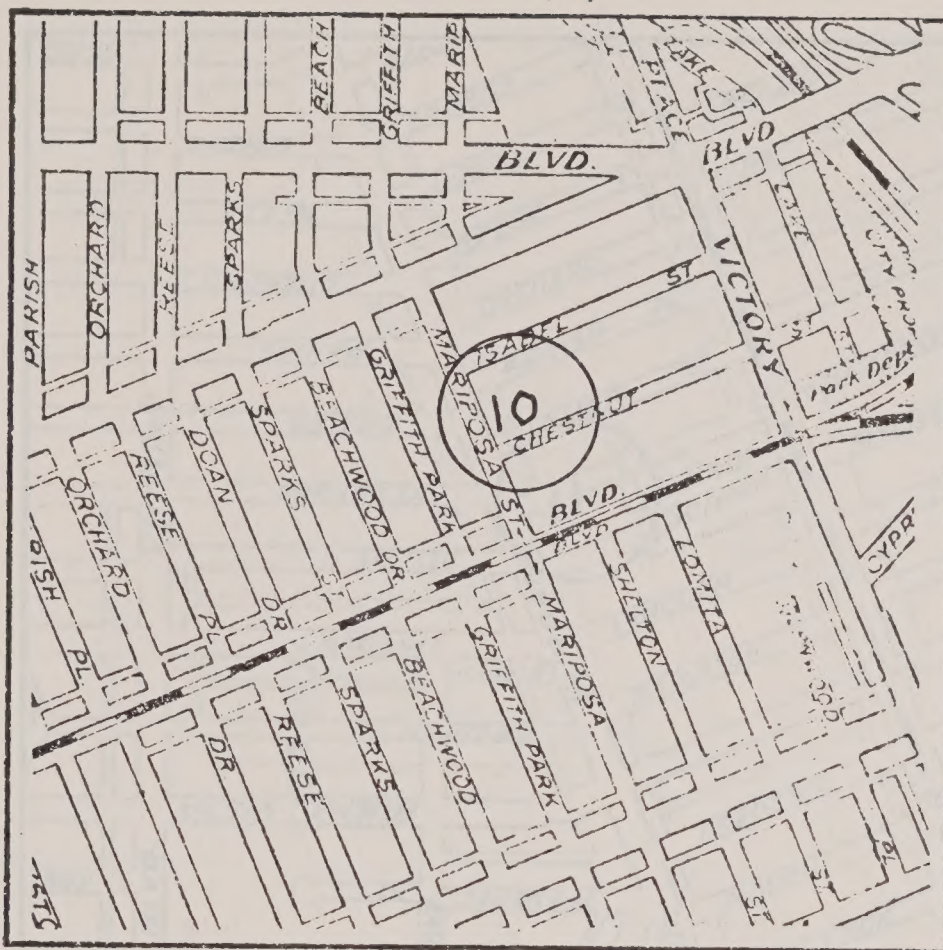
Noise Sources - passenger cars, sports cars and light trucks, motorcycles, trucks and buses aircraft.

Measurement Values (dBA) -

Peak	Residual	Day	Evening	Night
-	-	64	63	60

Comments - Residual noise level set by Harbor Boulevard, Victory Boulevard, and Victory Place traffic.

Site Number - 10



Location - On Mariposa, 20 feet from the centerline at 810 Mariposa.

Noise Sources - Passenger cars, trucks and buses, aircraft.

Measurement Values (dBA) -

	Day	Evening	Night
Residual	48	45	44
Peak	-	-	-

Comments - Human activity limits residual noise level.



Location - On Mariposa, 20 feet from the centerline at 810 Mariposa.

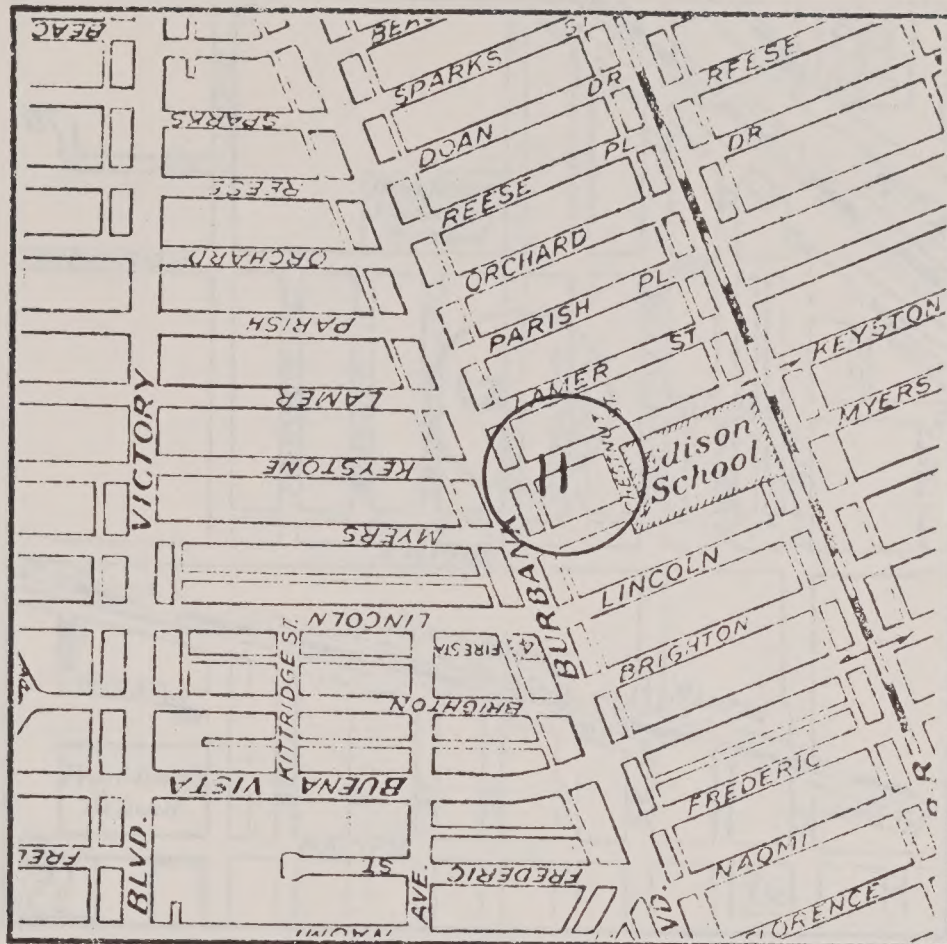
Noise Sources - passenger cars, trucks and buses, aircraft.

Measurement Values (dBA) -

Day	Evening	Night
48	45	44
-	-	-
Peak		

Comments - Urban activity (traffic, residential noise level).

Site Number - 11



Location - On Keystone, 20 feet from the centerline at 1,018 Keystone.

Noise Sources - Passenger cars, sports cars and light trucks, aircraft.

Measurement Values (dBA) -

	Day	Evening	Night
Residual	46	45	43
Peak	-	-	-

Comments -- Residual noise level is set by Burbank Boulevard.



Location - On Highway, 30 feet from the centerline at 1,018 Keyhole.

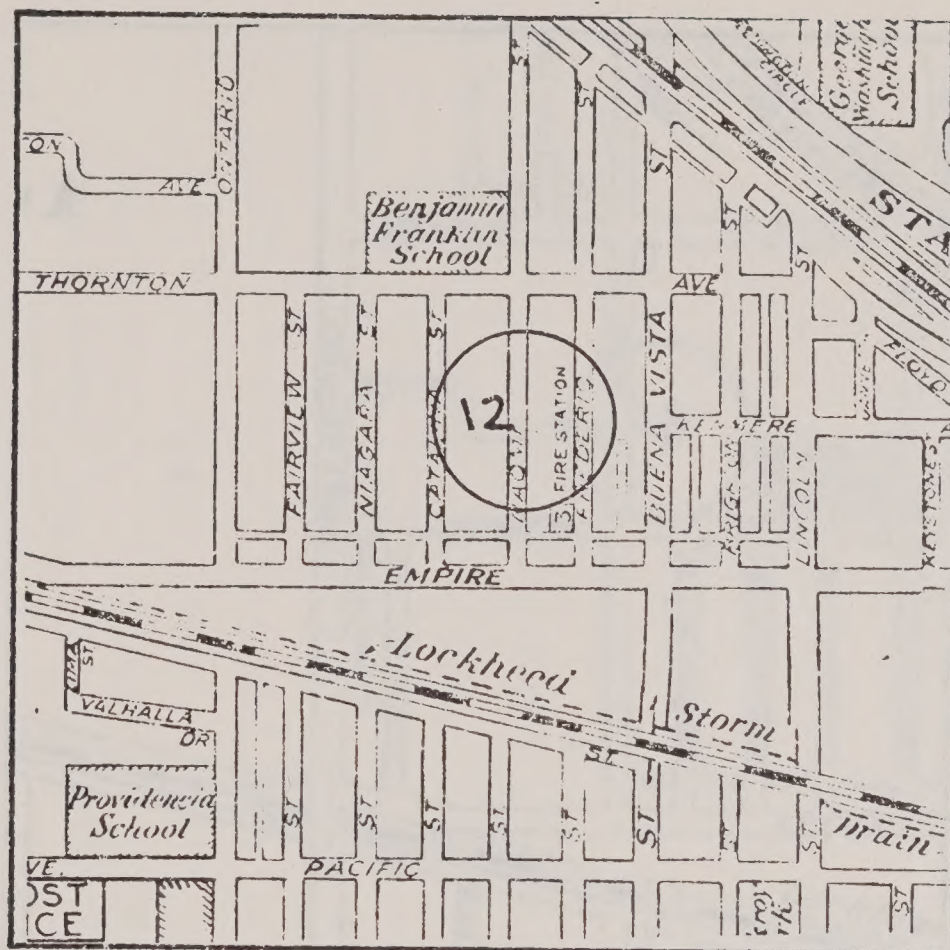
Noise Sources - Passenger cars, sports cars and light trucks, aircraft.

Measurement Values (dBA) -

Residual	Day	Evening	Night
Peak	46	42	43

Comments - Residual noise level is set by Bureau Boulevard.

Site Number - 12



Location - On Naomi, 20 feet from the centerline at 2,316 Naomi.

Noise Sources - Passenger cars, trucks and buses, aircraft.

Measurement Values (dBA) -

	Day	Evening	Night
Residual	45	45	45
Peak	-	-	-

Comments - Birds and children playing determine daytime residual noise level.



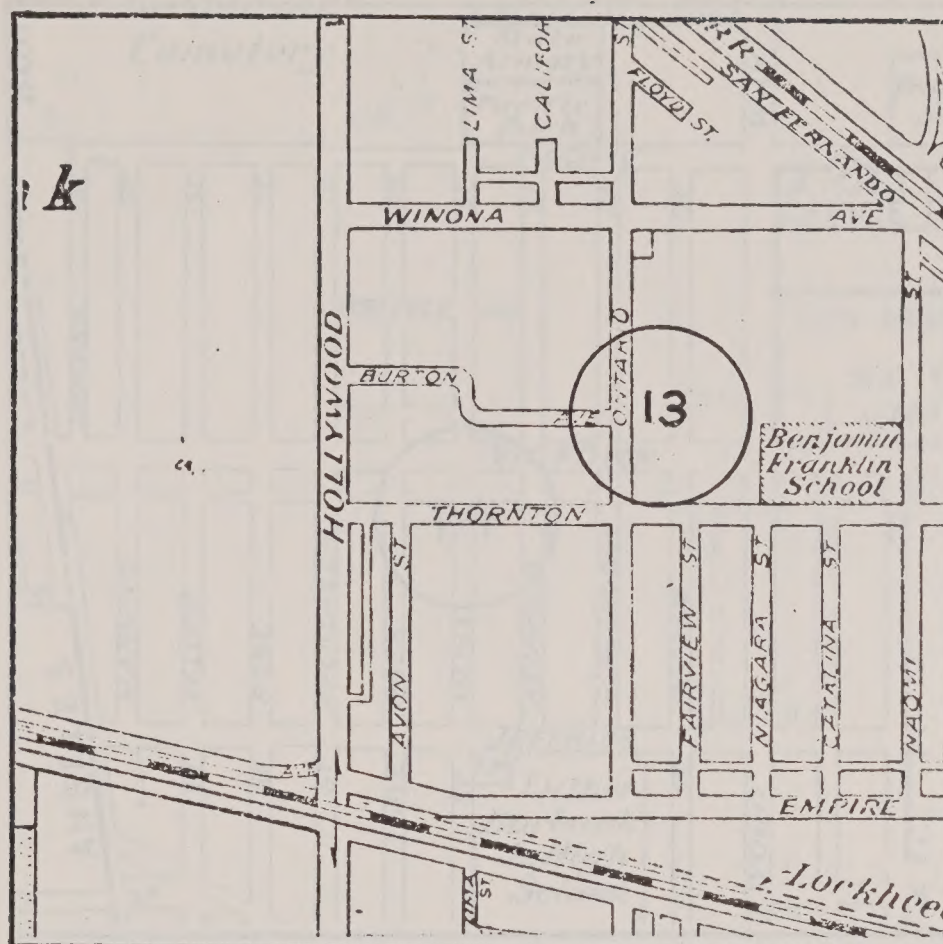
Location - On Main, 20 feet from the centerline at
2,316 North.

Noise Sources - Passenger cars, trucks and buses, aircraft.

Measurement Values (dBA) -			
Residential	Day	Evening	Night
Peak	42	45	42

Comments - Birds and children playing determine daytime residential noise level.

Site Number -13



Location - On Ontario, 20 feet from the centerline and 200 feet from the centerline of Thornton.

Noise Sources - Passenger cars, aircraft.

Measurement Values (dBA) -

	Day	Evening	Night
Residual	51	51	48
Peak	-	-	-

Comments - Daytime residual N.L. is limited by automobile traffic, evening R.N.L. is set by airport ground operations, night-time residual set by industrial activity.



Location - On Ontario, 20 feet from the centerline and 200 feet from the centerline of Thornton.

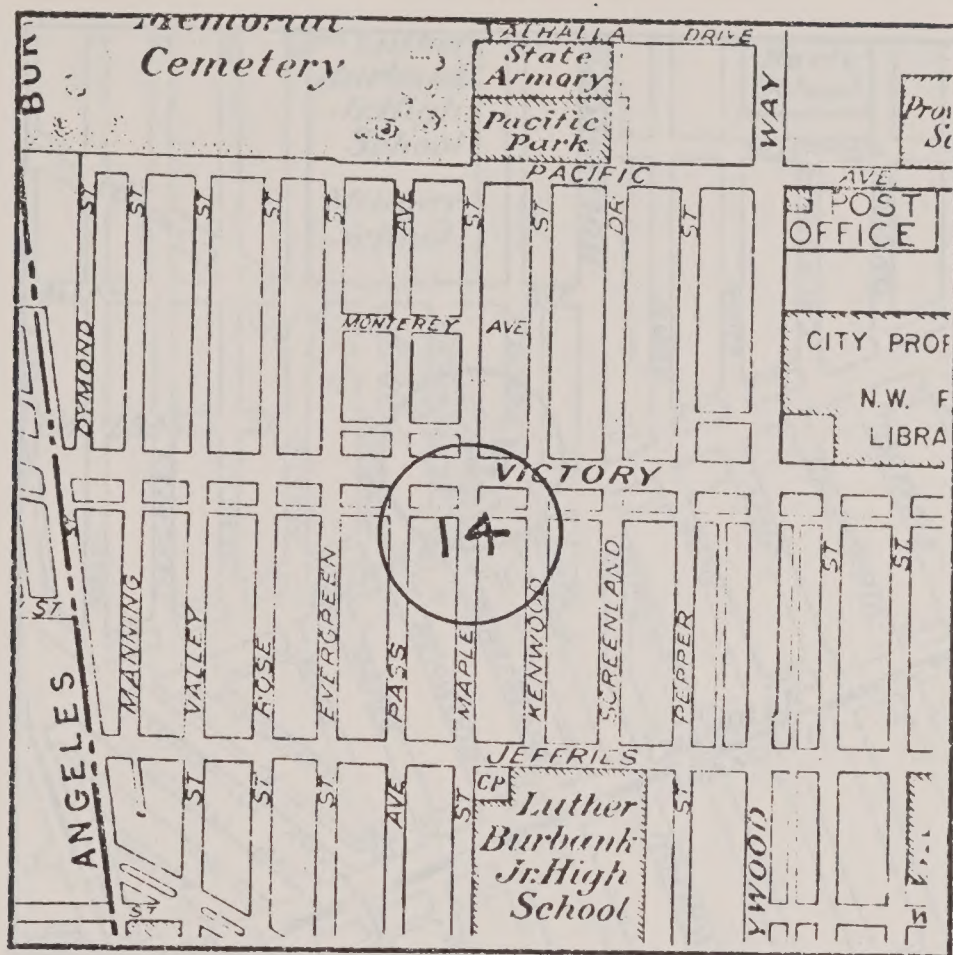
Noise Sources - Passenger cars, aircraft.

Measurement Values (dBA) -

Residual	Day	Evening	Night
Peak	51	51	48

Comments - Daytime residual N.E. is limited by automobile traffic, evening N.E. is set by airport ground operations, night-time residual set by industrial activity.

Site Number -14



Location - On Maple, 20 feet from the centerline at 1,930 Maple.

Noise Sources - Passenger cars, aircraft.

Measurement Values (dBA) -

	Day	Evening	Night
Residual	48	48	46
Peak	-	-	-

Comments - Residual noise level is set by traffic on Victory and Distant traffic.



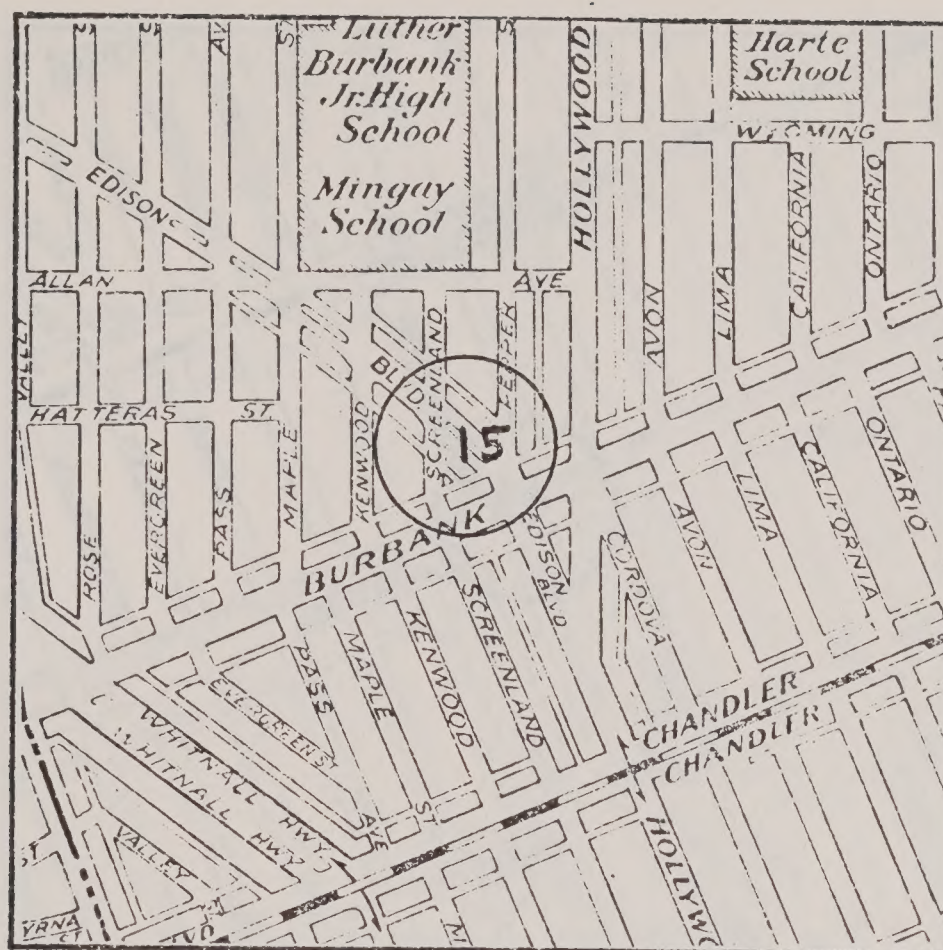
Location - On Maple, 50 feet from the centerline at 1930
Maple.

Noise Sources - Passenger cars, aircraft.

Measurement Values (dBA) -			
Residual	Day	Evening	Night
48	48	48	48
Peak	-	-	-

Comments - Residual noise level is set by traffic on Victory and
distant traffic.

Site Number - 15



Location - On Pepper, 20 feet from the centerline at 1,501 Pepper.

Noise Sources - Passenger cars, aircraft.

Measurement Values (dBA) -

	Day	Evening	Night
Residual	47	47	46
Peak	-	-	-

Comments - Residual noise level set by traffic on Burbank and Edison with occasional intrusions from the Cal Green bodyshop.



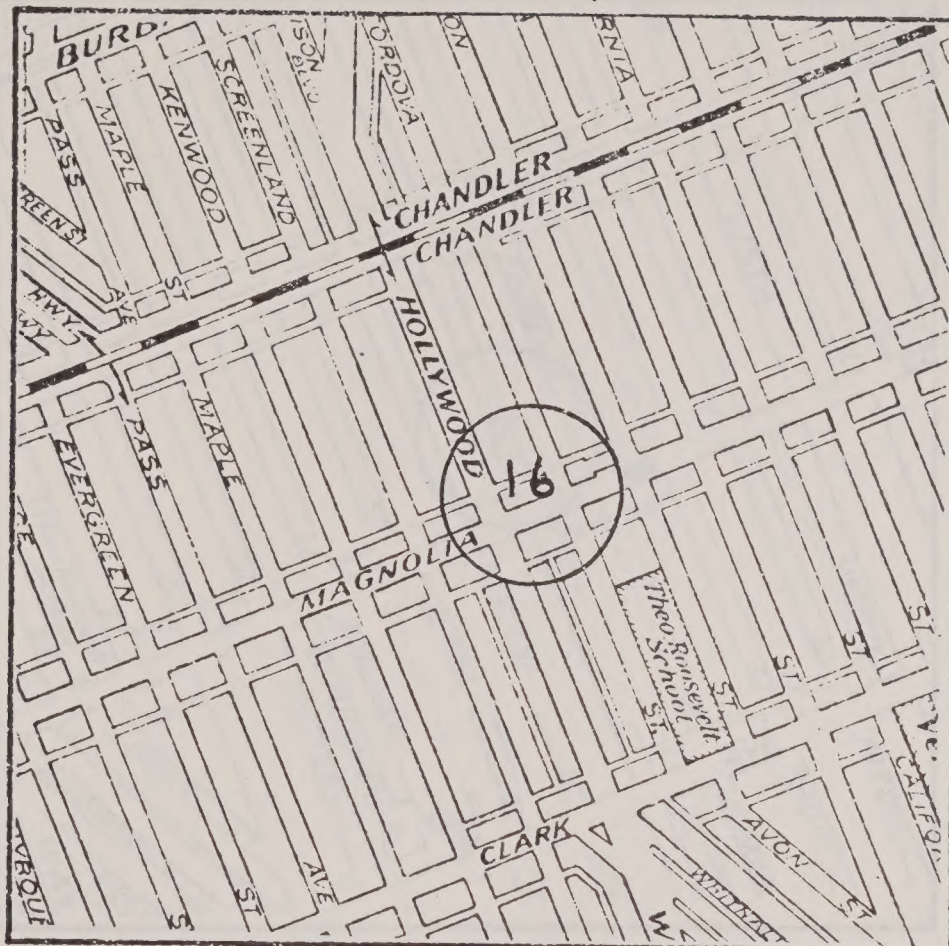
Location - On Pepper, 20 feet from the centerline at 1,501 Pepper.

Noise Sources - Passenger cars, aircraft.

Measurement Values (dBA) -			
Residual	Day	Evening	Night
Peak	47	47	45

Comments - Residual noise level set by traffic on Burbank and Edison with occasional intrusions from the Cal Green highway.

Site Number - 16



Location - On Magnolia, 40 feet from the centerline and
75 feet from the centerline of Hollywood Way.

Noise Sources - Passenger cars, sports cars and light trucks,
motorcycles, trucks and buses.

Measurement Values (dBA) -

	Day	Evening	Night
Residual	63	52	52
Peak	-	-	-

Comments - Residual noise level set by traffic on Magnolia and
Hollywood.



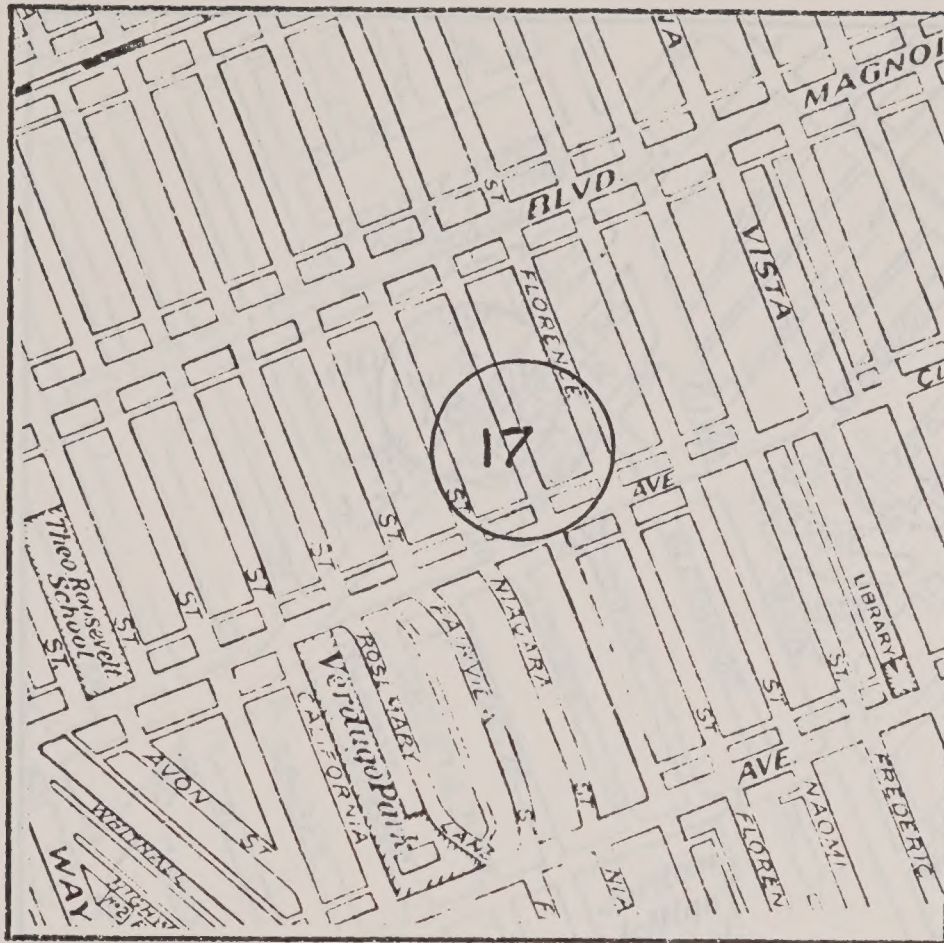
Location - On Main Street, 60 feet from the centerline and 75 feet from the centerline of Hollywood Way.

Noise Sources - Passenger cars, heavy cars and light trucks, motorcycles, trucks and buses.

Measurement Values (dBA) -			
Day	Evening	Night	Residential
67	52	52	52
-	-	-	-

Comments - Residential noise level set by traffic on Main Street and Hollywood

Site Number - 17



Location - On Clark, 20 feet from the centerline at 2,815 Clark.

Noise Sources - Passenger cars, sports cars and light trucks
trucks and buses aircraft

Measurement Values (dBA) -

	Day	Evening	Night
Residual	45	47	44
Peak	-	-	-

Comments - Residual noise level limited by distant aircraft and local traffic.



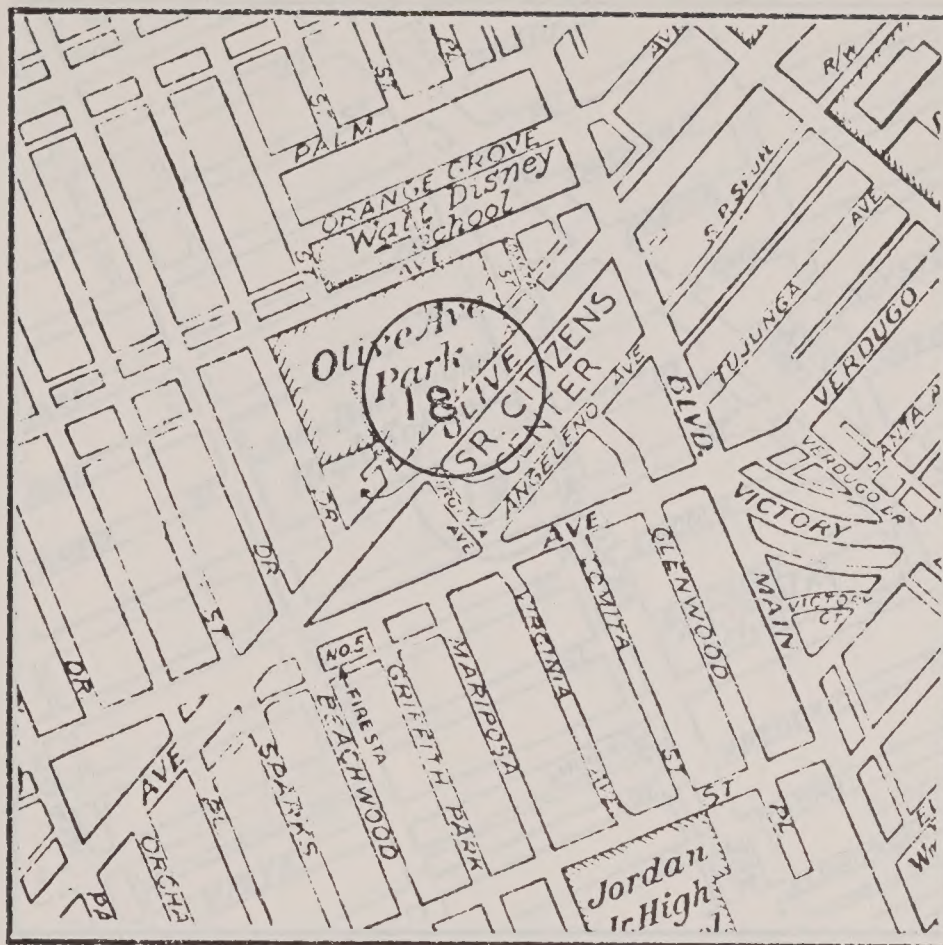
Location - on Clark, 30 feet from the centerline of
2,612 Clark.

Noise Sources - Passenger cars, sports cars and light trucks
trucks and buses aircraft

Measurement Value (dBA) -			
Day	Evening	Night	
42	47	44	Residential
-	-	-	Peak

Comments - Residential noise level limited by distant aircraft
and local traffic.

Site Number - 18



Location - On Olive, 65 feet from the centerline on Olive Avenue Park.

Noise Sources - Passenger cars, trucks and buses, aircraft.

Measurement Values (dBA) -

	Day	Evening	Night
Residual	53	51	50
Peak	-	-	-

Comments - Residual noise level is set by Olive traffic and distant aircraft.



Location - On Olive, 65 feet from the centerline on Olive Avenue Park.

Noise Sources - Passenger cars, trucks and buses, aircraft.

Measurement Values (dB) -

Residual	Day	Evening	Night
Peak	53	51	50

Comments - Residual noise level is set by Olive traffic and distant aircraft.

Site Number - 19



Location - On Keystone, 20 feet from the centerline at 301 Keystone.

Noise Sources - Passenger cars, motorcycles, trucks and buses.

Measurement Values (dBA) -

	Day	Evening	Night
Residual	53	50	48
Peak	-	-	-

Comments - Keystone and Verdugo traffic limit residual noise level.



Location - On Keystone, 20 feet from the centerline at 301
Keystone.

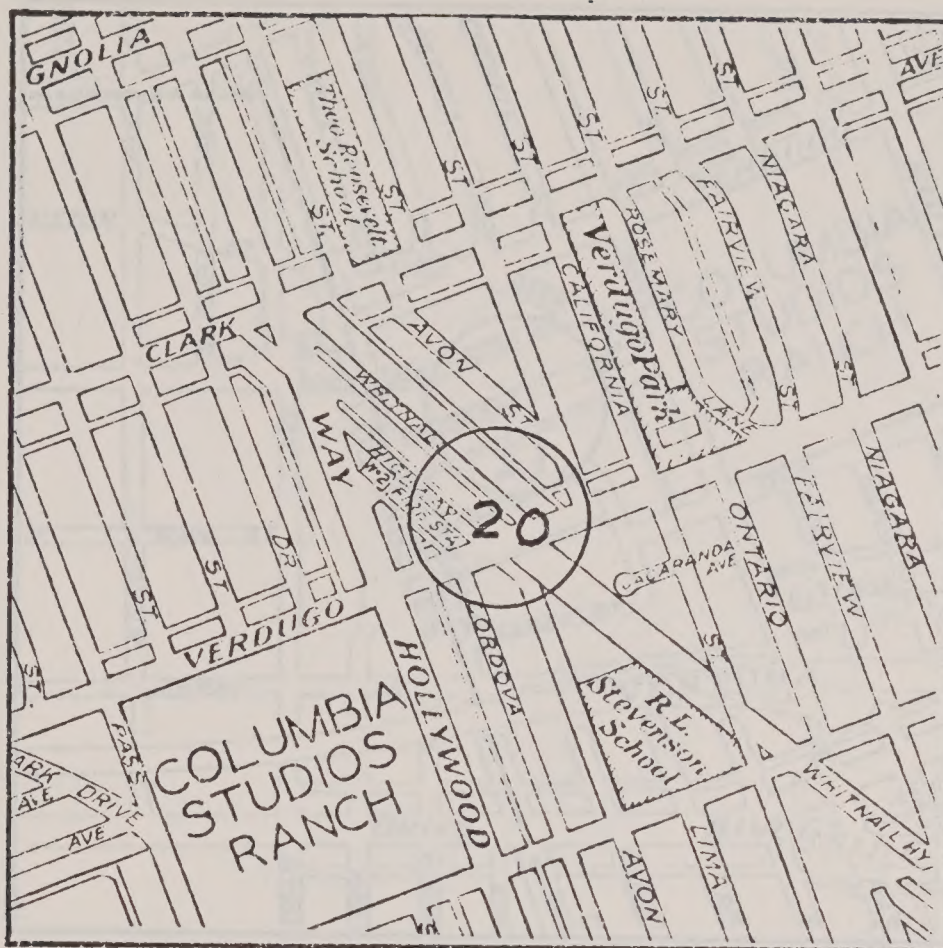
Noise Sources - Passenger cars, motorcycles, trucks and buses.

Measurement Values (dBA) -

Residual	Day	Evening	Night
Peak	53	50	48

Comments - Keystone and Verdugo traffic limit residual noise level.

Site Number - 20



Location - On Verdugo, 20 feet from the centerline at 3,611 Verdugo.

Noise Sources - Passenger cars, sports cars and light trucks, motorcycles, aircraft.

Measurement Values (dBA) -

	Day	Evening	Night
Residual	53	51	50
Peak	-	-	-

Comments - Residual is set by traffic on Hollywood and Verdugo.



Location - On Verdugo, 20 feet from the centerline at 3.611
Verdugo.

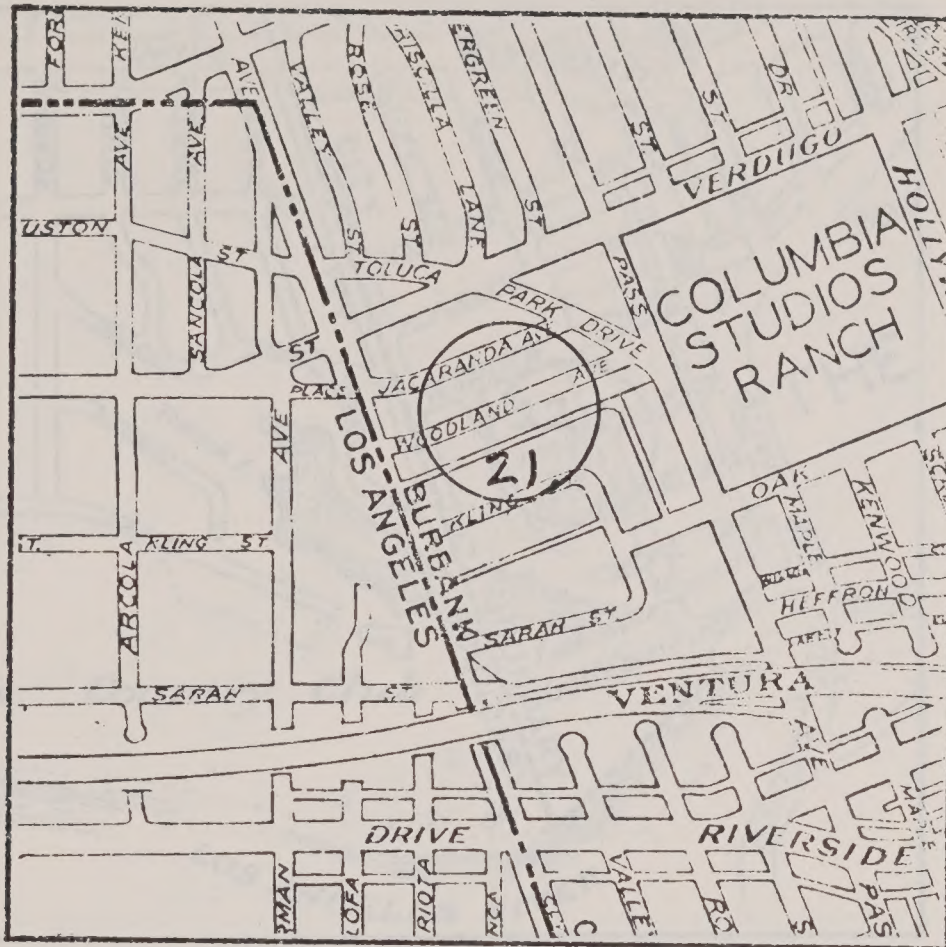
Notes Sources - Passenger cars, sports cars and light trucks,
motorcycles, aircraft.

Measurement Values (dBA) -

Residual	Day	Evening	Night
Peak	53	51	50

Comments - Residual is set by traffic on Hollywood and
Verdugo.

Site Number - 21



Location - On Klung, 20 feet from the centerline at 4,280 Klung.

Noise Sources - Passenger cars, trucks and buses, aircraft.

Measurement Values (dBA) -

	Day	Evening	Night
Residual	52	47	47
Peak	-	-	-

Comments - Jet ov erflights produce noticeable resonsnce in corridors between apartment complexes. Night-time residual noise level is set by Ventura Freeway traffic.



Location - On Rhine, 20 feet from the centerline at 4,280
Rings.

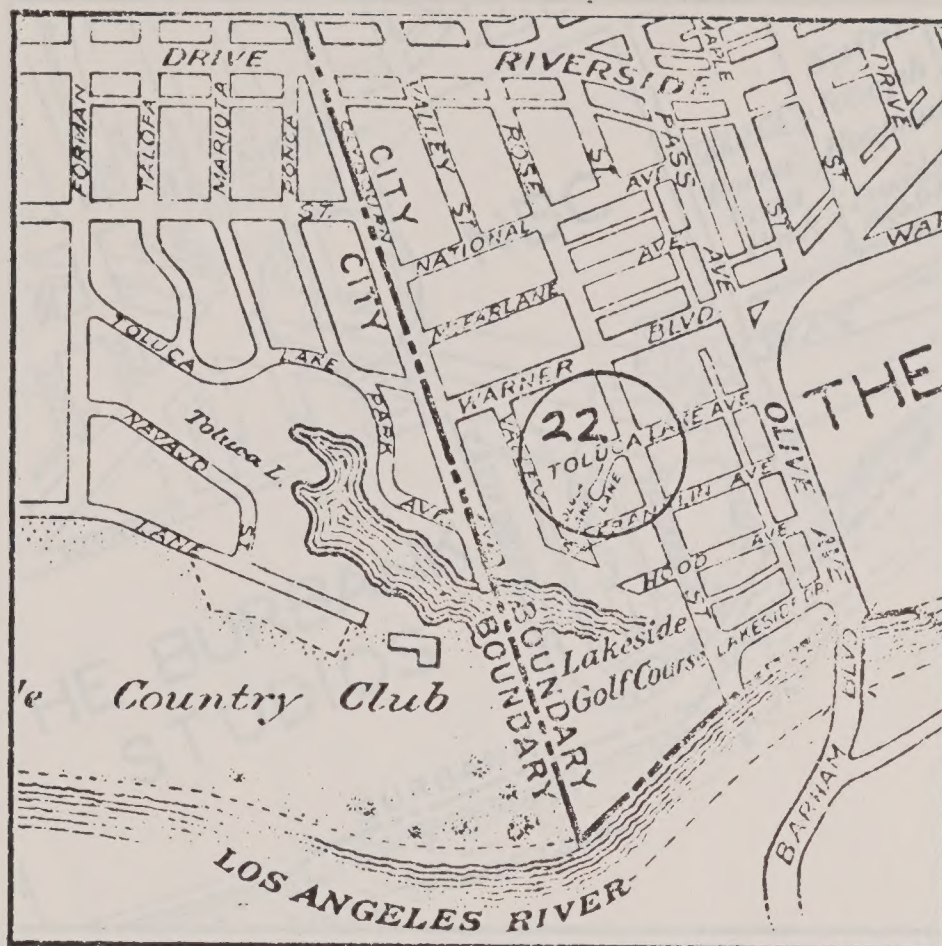
Noise Sources - Passenger cars, trucks and buses, aircraft.

Measurement Values (dBA) -

Residual	Day	Evening	Night
Peak	52	47	42

Comments - For an eight grade noticeable resonance
is reported between apartment complex. Night-
time residual noise level is set by Ventura freeway
traffic.

Site Number - 22



Location - On Rose, 20 feet from the centerline and 65 feet from the centerline of Franklin.

Noise Sources - Passenger cars.

Measurement Values (dBA) -

	Day	Evening	Night
Residual	49	43	43
Peak			

Comments - Very quiet suburban area, Olive activity, not available.



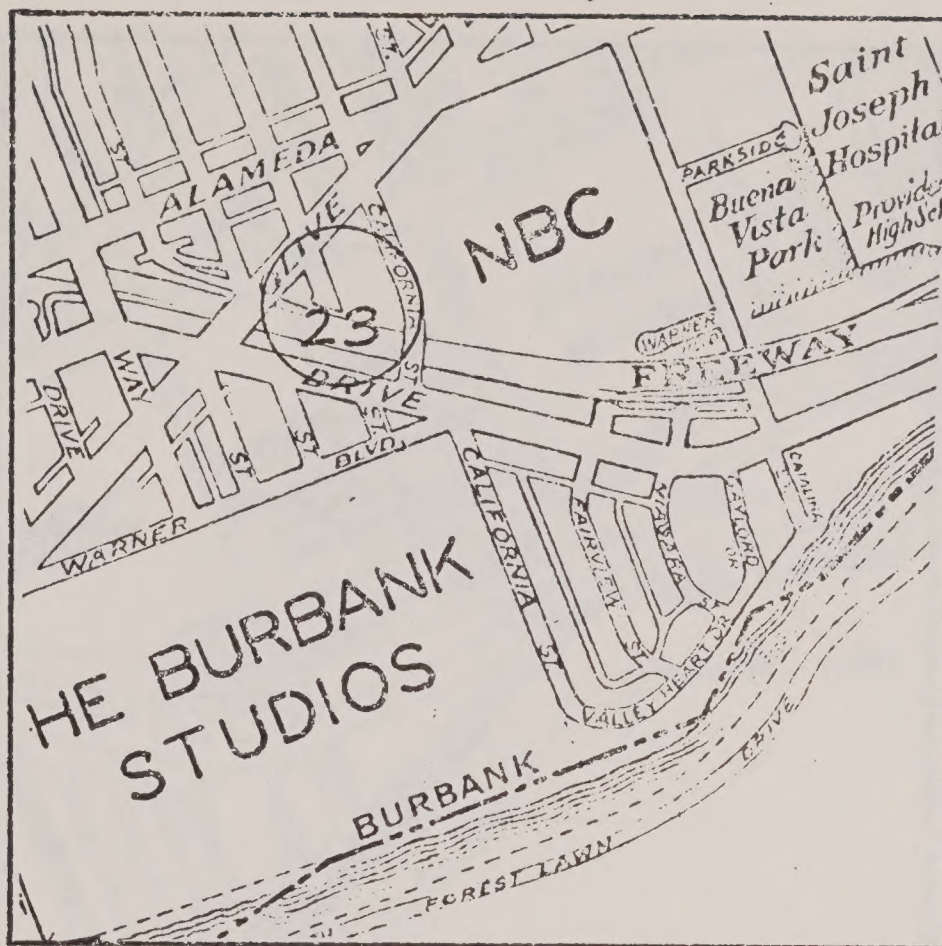
Location - On Ross, 10 feet from the centerline and 25 feet from the centerline of Franklin.

Noise Sources - Passenger cars.

Measurement Values (dBA) -			
Day	Evening	Night	Residential
49	43	43	Peak

Comments - Very quiet suburban area, little activity, not available.

Site Number - 23



Location - On California, 20 feet from the centerline at 215 California.

Noise Sources - Passenger cars, freeway, trucks and buses.

Measurement Values (dBA) -

	Day	Evening	Night
Residual	54	54	52
Peak	-	-	-

Comments - Residual noise level is set by Ventura Freeway.



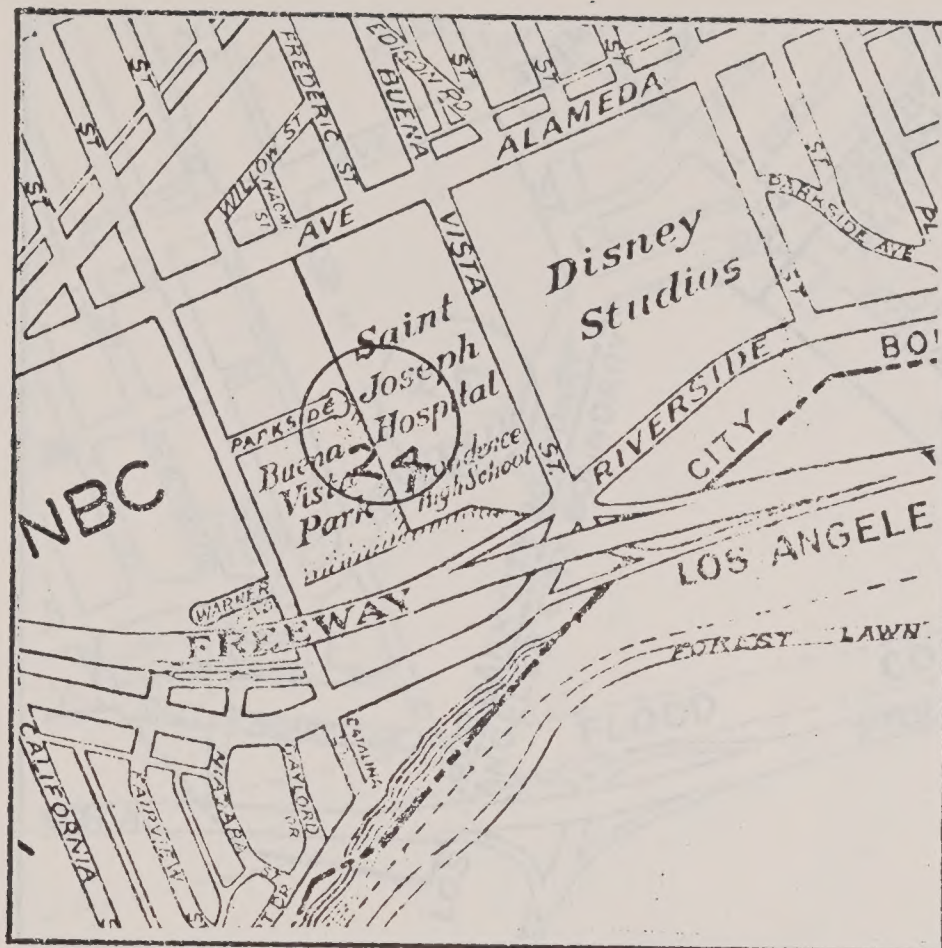
Location - On California, 10 feet from the centerline at 215 California.

Noise Sources - Passenger cars, freeway, trucks and buses.

Measurement Values (dBA) -			
Residual	Day	Evening	Night
54	54	54	52
Peak	-	-	-

Comments - Residual noise level is set by Ventura Freeway.

Site Number - 24



Location - At St. Joseph Hospital, 100 feet from the centerline of Parrside.

Noise Sources - Motorcycles (in Buena Vista Park), Freeway, trucks and buses, aircraft.

Measurement Values (dBA) -

	Day	Evening	Night
Residual	62	60	54
Peak			

Comments - Ventura Freeway and St. Josephs Hospital activity limit residual noise level.



Location - At St. Joseph Hospital, 100 feet from the centerline of Freeway.

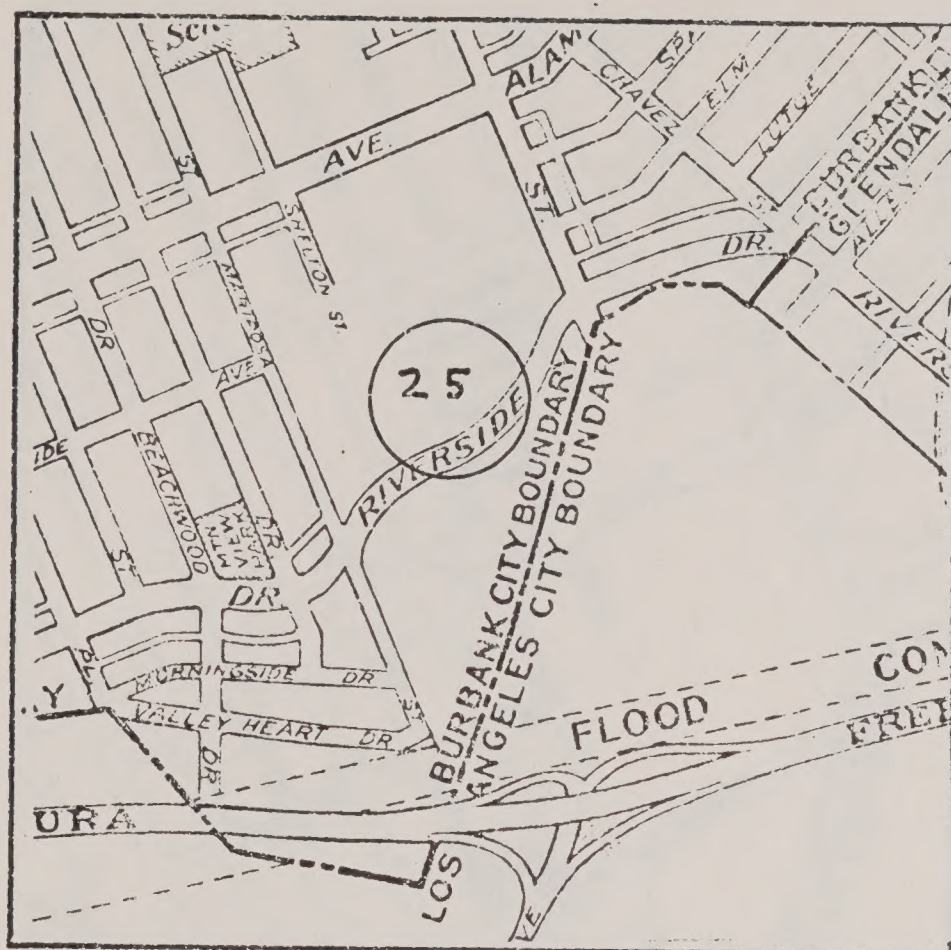
Noise Sources - Motorcycles (in Buena Vista Park), Freeway, Trucks and Buses, Aircraft.

Measurement Values (dBA) -

Residential	Day	Evening	Night
Peak	62	60	54

Comments - Ventura Freeway and St. Joseph's Hospital activity limit residential noise level.

Site Number - 25



Location - On Riverside, 75 feet from the centerline at 1,200 Riverside.

Noise Sources - Sports cars, and light trucks, trucks and buses.

Measurement Values (dBA) -

	Day	Evening	Night
Residual	57	55	55
Peak	-	-	-

Comments - Residual noise level limited by Ventura Freeway.



Location - on Riverside, 75 feet from the centerline at 1,200
Riverside.

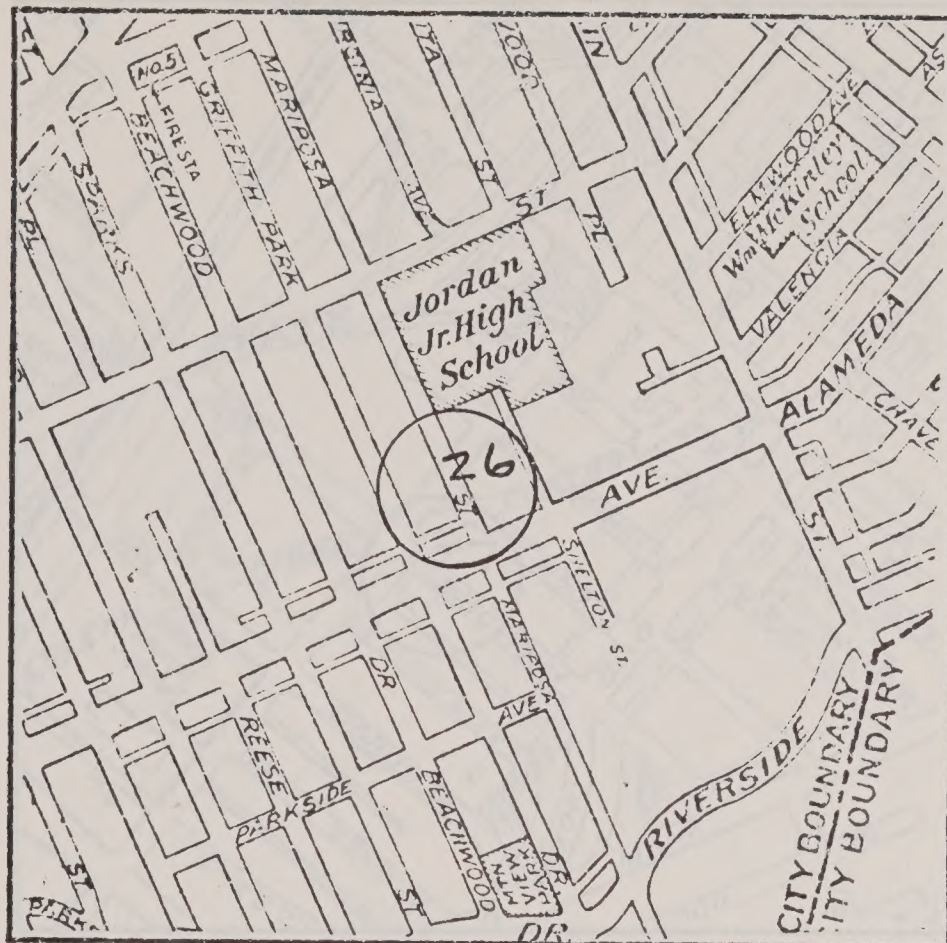
Noise Sources - Sports cars, and light trucks, trucks and buses.

Measurement Values (dBA) -

Day	Evening	Night
57	55	52
Peak		

Comments - Residential noise level limited by Ventura Freeway.

Site Number - 26



Location - On Mariposa, 20 feet from the centerline at 537 Mariposa.

Noise Sources - Passenger cars, motorcycles

Measurement Values (dBA) -

	Day	Evening	Night
Residual	50	50	43
Peak	-	-	-

Comments - Residual noise level set by traffic on Alameda and Ventura Freeway.



Location - On Highway, 50 feet from the centerline at 537
 Highway

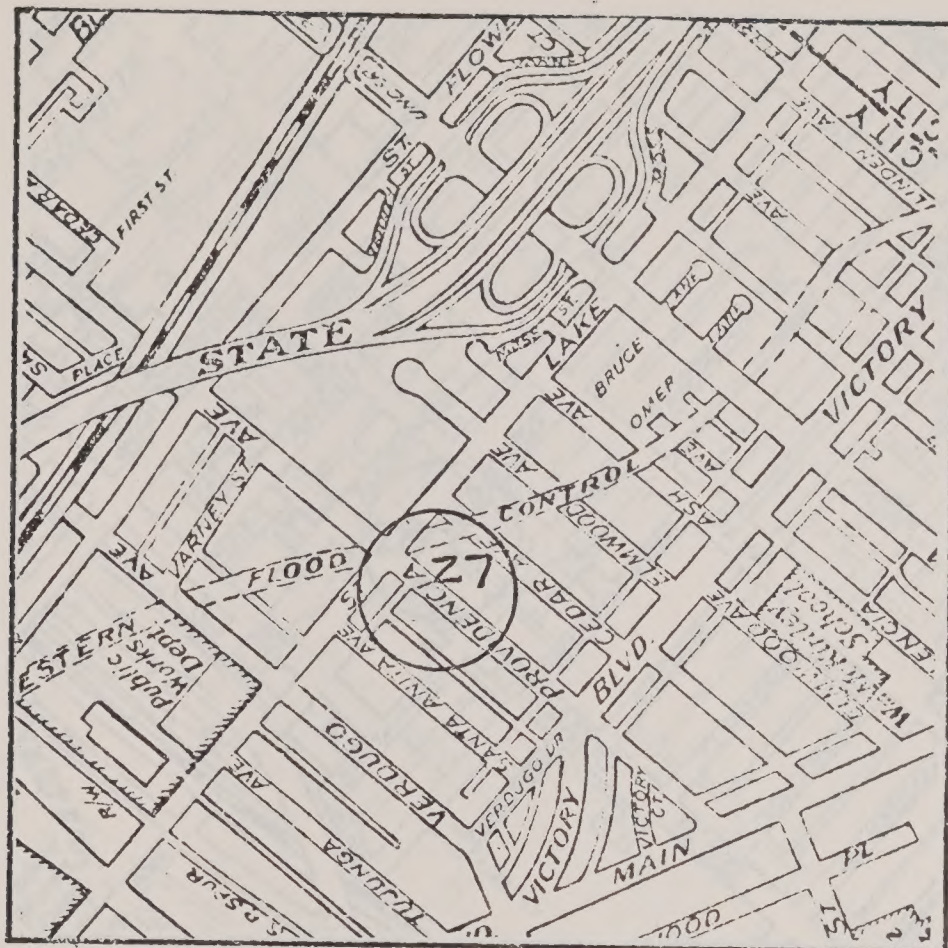
Noise Sources - Passenger cars, motorcycles

Measurement Values (dBA) -

Peak	Residual		
	Day	Evening	Night
-	50	50	43

Comments - Residual noise level set by traffic on Alameda and
 Ventura Freeway.

Site Number - 27



Location - On Providencia, 20 feet from the centerline at 521 Providence.

Noise Sources - Passenger cars, trucks and buses.

Measurement Values (dBA) -

	Day	Evening	Night
Residual	54	55	53
Peak	-	-	-

Comments — Residual noise level is set by Golden State Freeway and distant general aviation.



Location - On Providence, 30 feet from the centerline at
531 Providence.

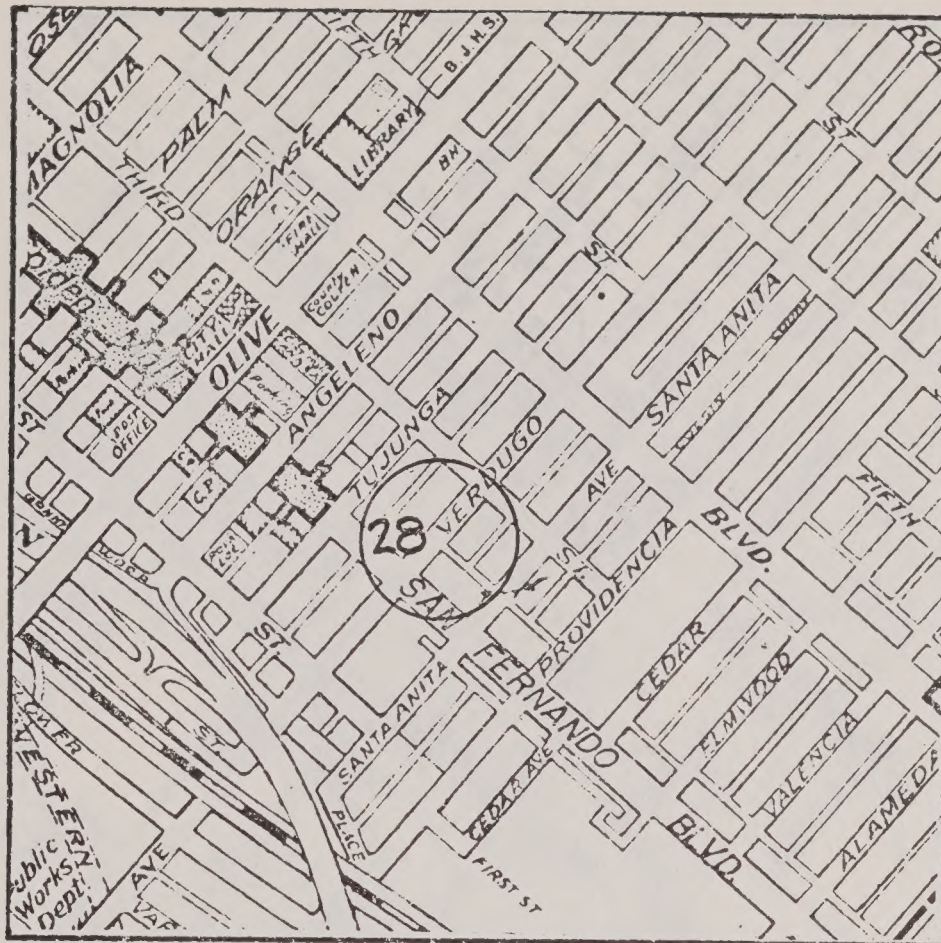
Noise Sources - Passenger cars, trucks and buses.

Measurement Values (dBA) -

Residual	Day	Evening	Night
Peak	54	55	53

Comments - Residual noise level is set by Golden State Freeway
and distant general aviation.

Site Number - 28



Location — On Verdugo, 20 feet from the centerline at 208 Verdugo.

Noise Sources — Passenger cars, sports cars and light trucks, trucks and buses.

Measurement Values (dBA) —

	Day	Evening	Night
Residual	57	55	55
Peak	-	-	-

Comments — Residual noise level set by San Fernando Boulevard and Golden State Freeway activity.



Location - On Veranda, 50 feet from the centerline at 300 Veranda.

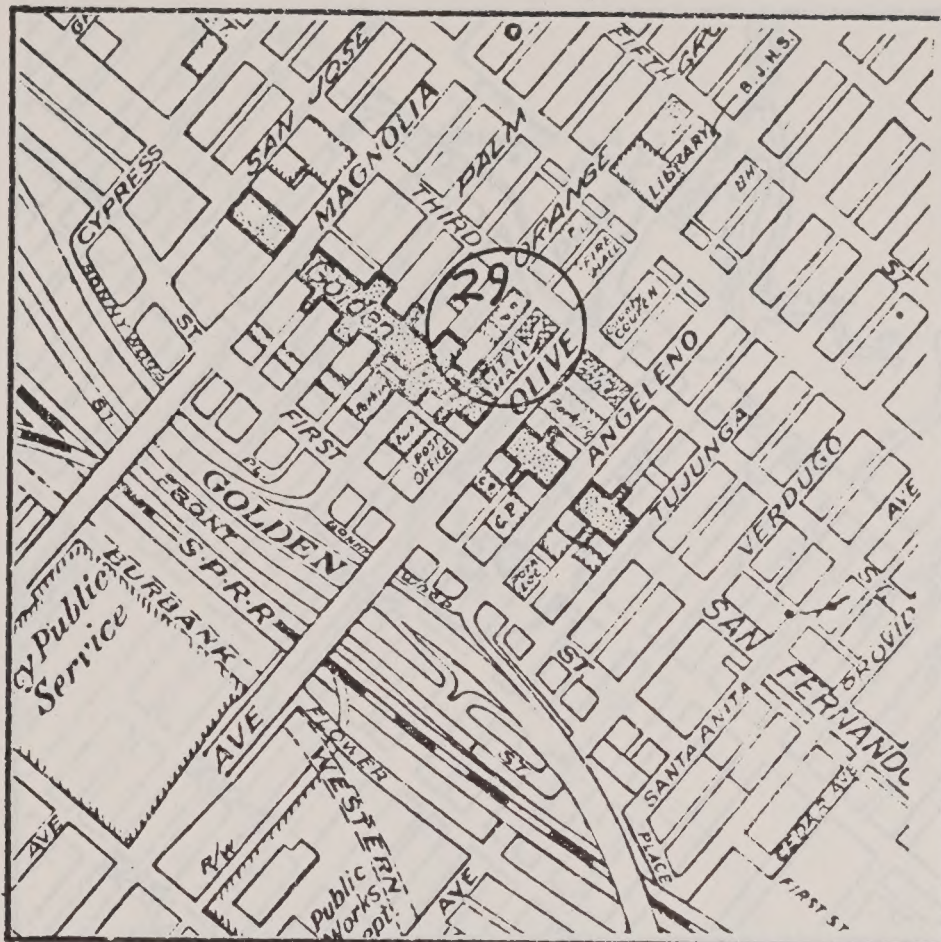
Noise Sources - Passenger cars, sports cars and light trucks, trucks and buses

Measurement Value (dBA) -

Residual	Day	Evening	Night
Peak	27	22	22

Comments - Residual noise level at 300 Veranda Boulevard and Golden State Freeway activity.

Site Number - 29



Location - Golden Mall, on Olive, 30 feet from the centerline at 246 Olive.

Noise Sources - Passenger cars, sports cars and light trucks, motorcycles, trucks and buses.

Measurement Values (dBA) -

	Day	Evening	Night
Residual	57	55	55
Peak	-	-	-

Comments - Residual noise level is set by local transportation activities.



Location - Golden Mall, on Olive, 30 feet from the centerline at
3rd Olive.

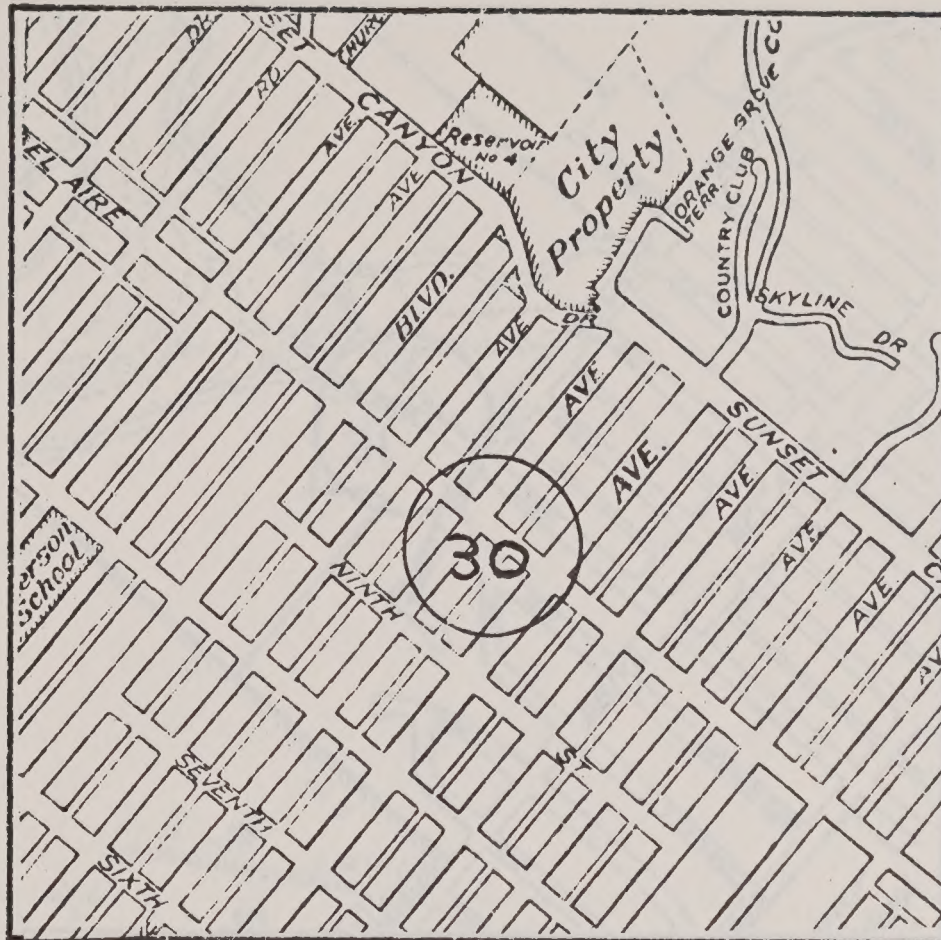
Noise Sources - Passenger cars, sports cars and light trucks,
motorcycles, trucks and buses.

Measurement Values (dBA) -

Residual	Day	Evening	Night
	57	55	55
Peak	-	-	-

Comments - Residual noise level is set by local transportation
activities.

Site Number -- 30



Location - On Belaire, 20 feet from the centerline and 65 feet from the centerline of Olive

Noise Sources - Passenger cars, trucks and buses, aircraft.

Measurement Values (dBA) -

	Day	Evening	Night
Residual	44	45	42
Peak	-	-	-

Comments - Residual noise level is set by distant aircraft and transportation noise sources.



Location - On Belaire, 50 feet from the centerline and 65 feet from the centerline of Olive

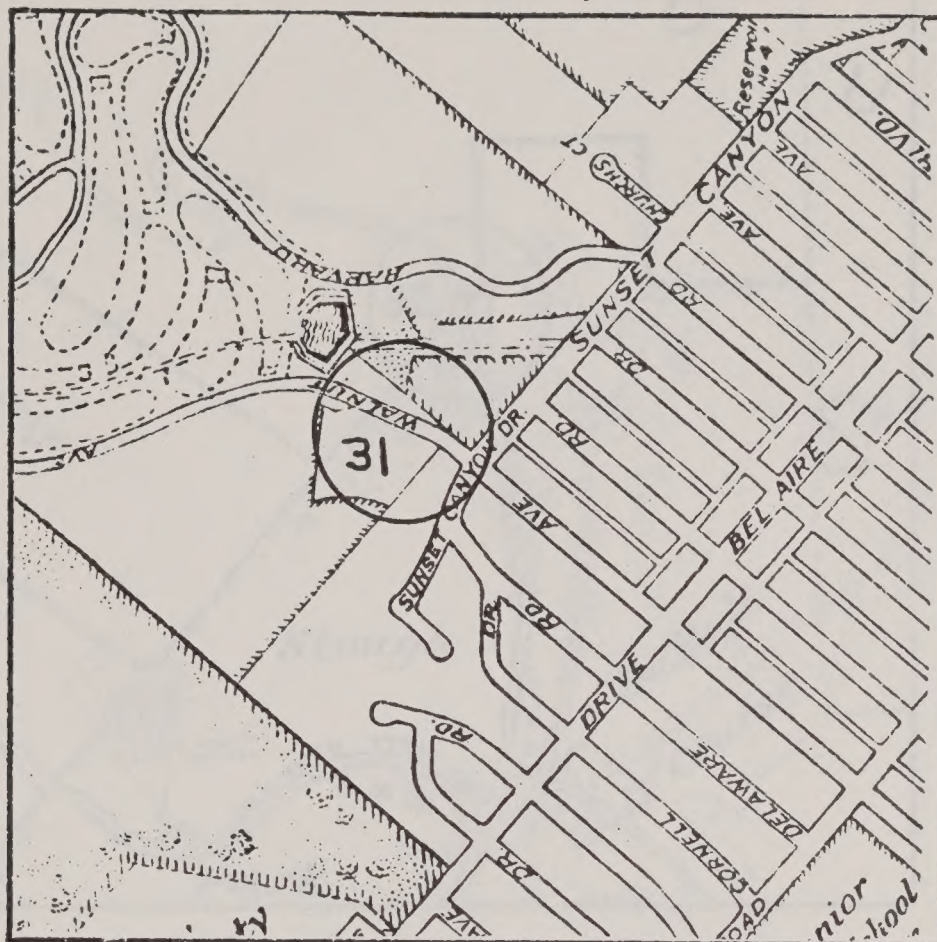
Noise Sources - Passenger cars, trucks and buses, aircraft.

Measurement Values (dBA) -

Residual	Day	Evening	Night
Peak	44	45	43

Comments - Residual noise level is set by distant aircraft and transportation noise sources.

Site Number -31



Location — On Walnut, 20 feet from the centerline and 250 feet from the centerline of Sunset Canyon Drive.

Noise Sources — Passenger cars.

Measurement Values (dBA) —

	Day	Evening	Night
Residual	45	46	46
Peak	-	-	-

Comments — Residual noise level is set by distant freeway and general aviation activity.



Location - On Walnut, 30 feet from the centerline and 350 feet from the centerline of Sunset Canyon Drive.

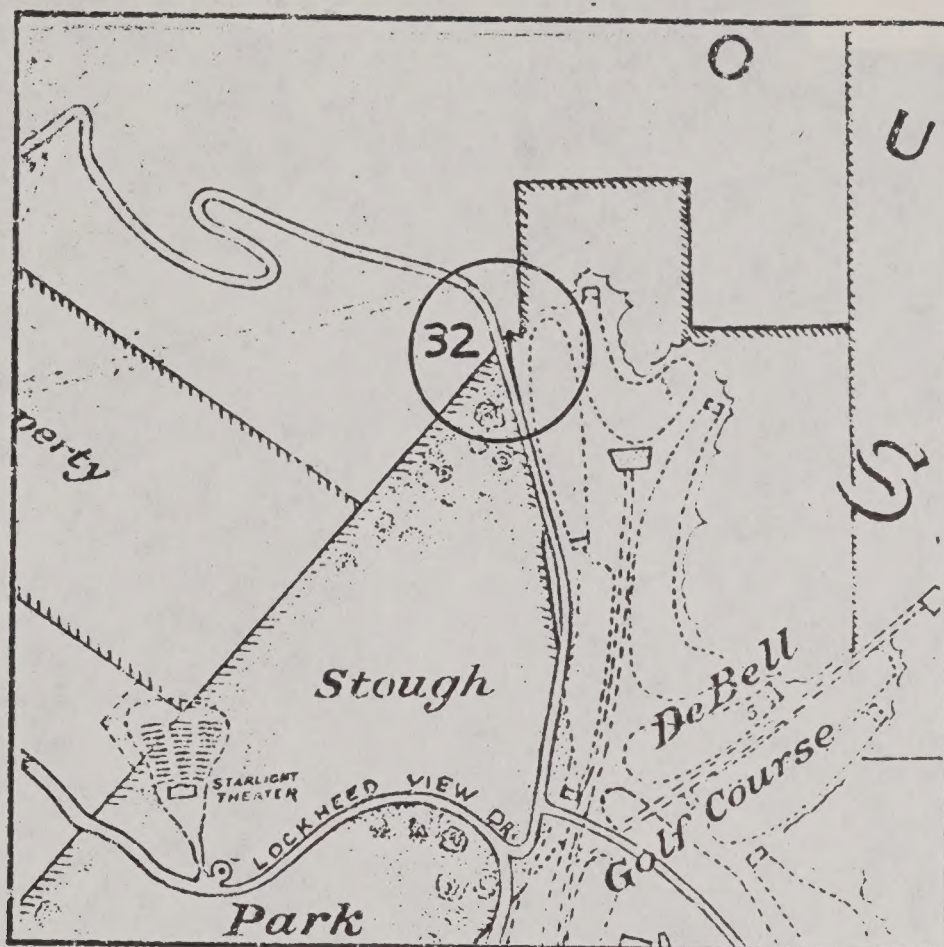
Noise Sources - Passenger cars.

Measurement Value (dBA) -

Residual	Day	Evening	Night
45	45	45	45
Pass	-	-	-

Comments - Residual noise level is set by distant freeway and general aviation activity.

Site Number - 32



Location - On Walnut 20 feet from the centerline at termination of Walnut near DeBell Golf Course.

Noise Sources - Passenger cars, aircraft.

Measurement Values (dBA) -

	Day	Evening	Night
Residual	42	46	42
Peak	-	-	-

Comments - Human activity and aircraft flyovers limit daytime residual. Evening residual set by golf course sprinklers. Night residual is set by distant freeway traffic.

INSTITUTE OF ENVIRONMENTAL STUDIES LIBRARY
40 HILLCROFT HALL
UNIVERSITY OF CALIFORNIA
BERKELEY, CA 94720

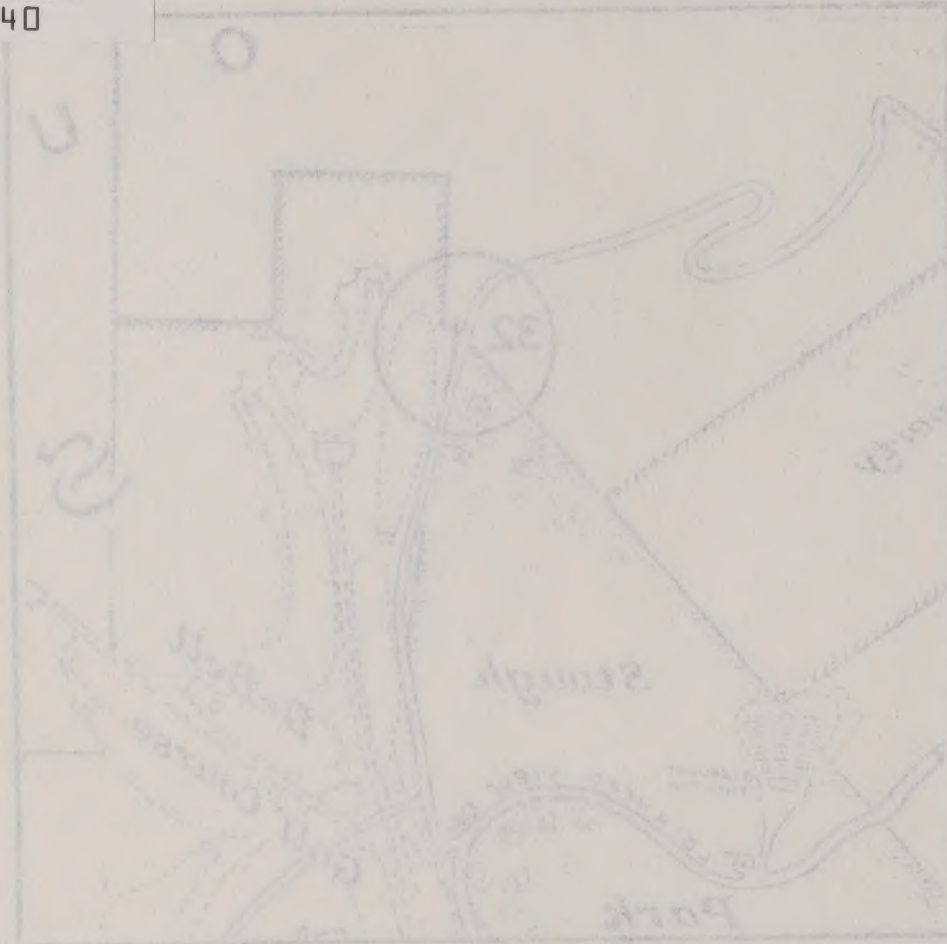
77 02272

U.C. BERKELEY LIBRARIES



048023210

Site Number - 32



Location - On Walnut 30 feet from the centerline at termination of Walnut near Derrill Golf Course.

Noise Sources - Passenger cars, aircraft.

Measurement Values (dBA) -

Residual	Day	Evening	Night
Peak	42	46	42

Comments - Human activity and aircraft flyovers limit daytime residual. Evening residual set by golf course sprinklers. Night residual is set by distant freeway traffic.

INSTITUTE OF GOVERNMENTAL STUDIES LIBRARY
109 PHILOSOPHY HALL
UNIVERSITY OF CALIFORNIA
BERKELEY, CA 94720

E-37